

Morton's Hand Books of the Farm.

N^o. X

**WORKMAN'S
TECHNICAL
INSTRUCTOR**

BY

WALTER J. MALDEN.

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MORTON'S HANDBOOKS OF THE FARM.

Edited by JAMES SINCLAIR, *Editor of "Agricultural Gazette," "Live Stock Journal," &c.*

No. X.

WORKMAN'S TECHNICAL INSTRUCTOR.

BY
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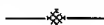
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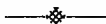
The present volume is one of a series discussing the Cultivation of the Farm, its Live Stock, and its Cultivated Plants, Farm and Estate Equipment, Dairying, and Farm Labour, the Chemistry of Agriculture, and the Processes of Animal and Vegetable Life. Among the writers who have been engaged on them are Messrs. T. BOWICK, the late W. BURNES, GILBERT MURRAY, the late W. T. CARRINGTON, the late Rev. G. GILBERT, Messrs. JAMES LONG, W. J. MALDEN, J. HILL, SANDERS SPENCER, and the late J. C. MORTON, Professors G. T. BROWN, J. WORTLEY-AXE, and J. SCOTT, the late Professor JAMES BUCKMAN, Dr. MAXWELL T. MASTERS, F.R.S., and Professor R. WARINGTON, F.R.S.

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WORKMAN'S TECHNICAL INSTRUCTOR.

INTRODUCTION.

A SKILLED farm labourer is a man of many accomplishments. In fact there are few craftsmen who require so varied a knowledge. This is contrary to popular opinion ; but if those who speak of the "lazy labourer" as an unskilled workman attempt any one of the many operations which may fall to his lot any day, they soon realise that he is getting over the work more rapidly, more easily, and more skilfully than they had previously supposed ; and they recognise that this is the result of training and method as opposed to mere brute force.

What are commonly spoken of as the ordinary acts of husbandry, including ploughing, drilling, hoeing, mowing, stacking, thatching, hedging, ditching, digging, and many others, which date before the introduction of modern machinery, are still as necessary as in the past. The introduction of intricate machinery, such as threshing machines, reaping machines, drills, etc., extended the scope of the labourer's calling, and demanded special skill. In addition to the above, there are many operations bearing on the work of the shepherd, horsekeeper, and stockman, making in all a very long list, and no man need

feel ashamed of his calling if he can execute all the items with skill. We know men who can perform any one of these operations in a thoroughly workmanlike manner. Such men, however, are only met with on farms where the farmer has taken pains to train his men, and is careful that nothing but good work is done; or in districts which have been for a long time influenced by agricultural societies, which have encouraged high-class work by offering prizes for competitions in the more important operations.

For years we have written urging the extension of these competitions, and it is pleasing to see that several County Councils have apportioned part of the funds available for agricultural education to be awarded as prizes to labourers for skilled work. The management of labour is one of the most important sections of the farmer's work, as success in farming depends to no small extent on the value derived from it. Unless the farmer is able to correct his men when work is being badly executed he is not worthy the title of practical farmer. Unfortunately, too many farmers are either careless or unable to do this; for one sees a very large amount of work being done in an indifferent manner.

In the course of several years' agricultural teaching, we have felt the want of a text-book to place in the hands of pupils, treating of these simple operations, which, small in themselves, are the foundation of success in the management of the farm. A large number of agricultural text-books have been published in recent years, but they deal with agriculture as a science rather than as an art. As a rule, the agricultural education provided by County Councils and South

Kensington has gone in the same direction: and this has undoubtedly had much to do with its want of popularity among those who should benefit most by it. The Royal Agricultural Society has recognised this by making a knowledge of farm machinery a subject in their examinations. As in every other subject, the proper place to begin at is the bottom—no one puts the roof on a house before the foundations are laid. The best science cannot make good the faults of bad practice; but good science grafted on to good practice is embraced in the methods of the most successful farmers among us. If this little book should be the means of directing a few to become better workmen, it will have succeeded in making them better farmers.

The majority of the illustrations in this book are original, but thanks are due to Messrs. Howard, Tasker, Ransomes, Sims & Jefferies, Blackstone, and the Hardy Pick Co., for those kindly lent by them.

W. J. M.

CHAPTER I.

DUTIES OF CARTER OR HORSEKEEPER.

THE CARTER OR HORSEKEEPER is an important farm servant, for the welfare of the horses depends greatly on his care and skill, while the smartness with which the horse-work on the farm is conducted is also dependent on him. Different systems of stable management prevail in various parts of the country: in some, a pair of horses is apportioned to each carter, who always works with these, and is responsible for their well-being and feeding; in others, a stable of six horses is given in charge of the head carter, and he is responsible for the feeding and health of these: he takes out a team himself, and the others are taken out by lads over whom he is supposed to have control, at anyrate to the extent of keeping them constantly at work, and seeing that the implements they are using are set so as to perform their operations to the greatest advantage.

Care of Horses.—The carter should be in the stable in the morning early enough to commence feeding the horses, so that they may be baited for two hours before starting out to work. Nothing tends to the good condition of the horse so much as the regular feeding for a lengthened period before turning out to work. Horses must be given small feeds frequently, therefore the filling up of the manger over night is useless, as the animals will not eat

what they have breathed upon and nosed over previously. Unless they are fed for a long time before being turned out to work, they become distressed early in the day. Nor must the carter confine himself to feeding the horses; he must proceed to clean them by scraping them with the curry-comb, brushing with the dandy-brush, and flipping off the dust with the buffeting cloth, which is generally made of a square piece of sacking, a handle being obtained by tying a stone, about the size of a duck's egg, in the middle of it, the loose ends being used for knocking out dust. Special care should be taken to clean those parts where the harness comes into contact with the skin, as extra perspiration collects there, and, consequently, more dirt lodges in them, which, if not got rid of, will cause sore places to form. If, from badly-fitting harness, or want of proper cleaning, sore places form, they should be well washed with water and dressed with embrocation. We have always found bathing with a solution of an ounce of sugar of lead (poisonous) to a quart of water most efficacious in hardening the skin when there has been a tendency to soreness.

The stable should be kept well ventilated, but the draught should pass over the animals' heads, and not by their legs. Manure should never be permitted to remain in the stable from day to day, as it causes an impure air, and is injurious to the horses' feet and eyes.

Feeding Horses.—When horses are brought in after long-continued work, care should be exercised in feeding. Occasionally horses will not face dry food in hot weather, unless they receive water first; a large quantity of water is liable to produce cramp or colic, but a small quantity—

sufficient to rinse out the mouth—is beneficial. If green food is not at hand, it is a good practice to give the first feeds of chaff and corn in the form of a sloshy mash; for, if dry short food be given to a very hungry horse, it is liable to bolt it, and form an impaction which may result in inflammation or death. It is far preferable to give long than short food at first, as horses cannot bolt it so rapidly, and it is better masticated; a small wisp of clover hay is, in our opinion, the best food to start feeding a ravenous horse upon. When the horse has cooled down, it may be permitted to drink more freely, but very cold water should be avoided when possible.

The practice of allowing horses to walk through a horse pond after returning from work has been the most frequent cause of the swelling and lameness known as grease. Horses with long hair about the fetlock are most liable to suffer from this, because the mass of hair retains much moisture; for as evaporation is always attended by a fall in temperature, and the drying in a stable is a lengthy operation, the horse's legs become chilled, the circulation of the blood is rendered sluggish, and disease is set up. The long hair, which is a natural protection from injury from blows, prevents moisture from coming in contact with the leg itself, and no matter how dirty the land may be, the leg is not chilled. It is far better that the dirt be left on the leg until it dries, when it may be knocked off. There is no common practice in horse management which requires such strong condemnation as the chilling of over-heated horses by walking them through the horse pond. It should never be permitted.

Corn for Horses.—The horsekeeper should have

control of the corn when brought into the stable, but the master or some other responsible person should give out the proper allowance which is to last for a definite period. Horsekeepers are often tempted to secure more corn than is considered sufficient by the master, consequently, the temptation to take too much should not be placed in their way.

Drugs.—No drugs should be used in the stable without the sanction of the master on each occasion. Advertised constitution and condition condiments should not be given without the master's knowledge. Lazy horsekeepers often use tonics to improve the condition of horses, and bring about the appearance which should be obtained by good stable management; but the effect of the drugs is only temporary, and a large number of horses are ruined or killed every year by their injudicious use. Any ailment should be reported to the master as soon as it is discovered, for delay is often fatal.

The horsekeeper should understand a horse's pulse, and be able to detect the beats readily so that he may tell if the horse is seriously unwell. The normal pulse is from thirty-six to forty-two beats per minute. The most convenient artery to feel is the one which is found by pressing the fingers along the underside of the jaw until the cord-like vein is felt, and the pulsation detected.

Fittings.—The carter should also see that fittings—such as plough-shares, mowing-machine fingers, cart-grease, machine oil, &c.—are always in store, and that the two latter are more frequently used than is generally the case.

Harnessing.—The work in the field is often rendered more severe because the horses are badly harnessed, or the whippetrees are wrongly adjusted. To see that this does not occur is a primary duty of the horsekeeper. The harness should be kept supple by oil so that buckles may be easily altered, and so that undue chafing is not caused. The places where chafing is most common are the poll, the shoulder, the withers, and the setting on of the tail. The top of the headstall produces sores on the poll; badly fitting saddles cause sore withers; hard croupers produce crouper gall; and ill-fitting collars cause sore shoulders. Sore shoulders are more common because, where working in chains, sufficient care is not taken that the chains are carried on the back-band. The back-band is now used most commonly as an ornament; whereas it is intended to sustain the weight of the whippetrees, thus acting as a check to the swaying which they set up, and which is usually borne by the shoulders, much to the detriment of the horse's working powers. The halter should be well secured to render it safe; but horses suffer most severely on occasions because the throat lash is buckled so tight that breathing is impeded. Bearing reins are required by farm horses to keep them out of mischief on occasions; but they need not be fastened in such a way that the horses cannot move their heads with fair freedom. A horse that is tightly reined-in cannot work so freely as when it can adjust its head so as to accommodate the whole action of its body to the work. It is often found necessary to give the horse's head absolute freedom when trying to move particularly heavy loads. The hames are made so that they can be adjusted, yet it is no uncommon thing to see a horse

drawing a load on its windpipe instead of on its shoulder. A slight alteration of the hames would cause the draught to fall in the right place. While guarding the windpipe the hames should not be set so that the horse has to carry the load on its neck. The draught should be as nearly as possible in a direct line from the shoulder.

Work in the Field.—In the field the carter should be capable of carrying out his employer's instructions, and he should know whether the work he is doing is such as ought to be continued if the weather changes during the absence of the master. He should overlook the work of the under carters in the absence of the master, and should see that their implements are doing their work properly. He should be capable of setting out work of all kinds; it is for him to measure out the lands and set the ridges when ploughing; to set the drill, and have it set before it is required for use so that no time is lost when the weather is favourable for the work. He should see that the horses' nose bags are filled before they are sent out of the stable.

CHAPTER II.

DUTIES OF STOCKMAN.

THE duties of the yardman and stockman differ in accordance with the kind of stock kept, for in some instances cow stock, in others rearing stock, in others fattening stock, in others grazing stock, and in others a mixture of all these are carried on a farm, and he must be acquainted with the management of each or all of the systems.

Where dairying is carried on he requires to understand milking and the management of milk. He must be of cleanly and tidy habits both in his person and work; he must recognise the first law of the dairy, which is cleanliness; and all utensils committed to his charge must be kept scrupulously clean. He should keep his hands and the cow's udder clean when milking, and the cowshed should be cleared of any matter which can ferment or give off unpleasant odours, for milk readily contaminates in the cow-byre, even during the few minutes that it necessarily remains in it; it should therefore be removed to a pure atmosphere without delay.

Milking is performed by the operator seizing the teat in a full grasp with the hand placed close to the udder, then gripping the upper portion of the teat firmly between the thumb and finger so as to cut off the flow of milk and prevent its return to the udder; the whole hand should be closed and the milk will necessarily be forced out of the

ower end of the teat. The teat should not be drawn through the thumb and finger, except in stripping, as it is likely to become sore with friction. Nevertheless, to the inexperienced, when watching the operation, it appears as though the teats are drawn somewhat in this manner, but it is in reality merely the regripping after each squeeze: a slight downward movement of the hands is necessary, but they should not be allowed to slide down the teat. The udder should be perfectly emptied or "stripped" at each milking, otherwise the most valuable portion of the milk will be left in the cow, and her milking properties will be destroyed. Gentle treatment is necessary, otherwise the cow will not allow the milker to approach, or when he has approached, she will hold back her milk. If cows hold back their milk very persistently, it is best to allow the calf to suckle one of the teats, and as the milk is allowed to come down to the calf, the milker can draw it from the other teats; in course of time she will give it freely without the calf. When approaching the cow, in fact any animal, it is advisable to speak so that she is not startled. Cows' teats often become tender through chafing, and this, with subsequent cracking, is frequently caused through the teats being left wet. If cows' teats show signs of cracking, they should be wiped dry after milking, and a little oil be rubbed on them.

Bedding.—Calf pens should be cleaned out regularly daily, as calves are very liable to scour if their pens are left in a foul condition. Fattening cattle feeding in stalls should be provided with dry and comfortable beds. To economise straw, and make the manure of even quality,

the littering should be done systematically. The straw should be placed dry under the forequarters of the animals in the morning; that which was placed under the forequarters on the previous night should be drawn back under the bellies, so as to catch the urine; and that which was under the bellies should be drawn back to catch the droppings. Fresh litter should be given night and morning, and the made dung should be taken out of the shed at the same time.

Feeding.—Cattle should be fed several times a day, but should not be disturbed between meals, as rest is essential to their well-doing. Each feed should be given on the principle of horse-feeding—in small baits, for the animals feed better so than when large quantities are thrown into the manger at once. If animals are receiving small quantities of cake or corn, it is advisable to give them the coarse food, such as chaff and roots at the first feeds, while their appetites are keen, and to give the corn when their appetites are partly appeased; in this way much larger quantities are consumed. Mangers should be cleaned out before commencing to give a fresh meal. Water should be kept constantly beside the animals, but the drinking troughs should not be allowed to become dirty, or the animals will suffer from thirst rather than drink it.

Chaff freshly cut is tough, and should be avoided. Meal newly ground is liable to ferment inside the stomach, generating gases, and causing the animal to become blown or hoven; so also does stale meal; therefore the stockman should see that a good supply is kept in hand, also that each meal-bin is thoroughly

cleaned out, as fermentation generally commences among that which is left at the bottom for a long time. Mouldy cakes are poisonous, and should be guarded against. Cakes should never be placed on damp floors, or against damp walls. It is necessary to stack the cake so that air circulates freely round each cake. If laid flat this is impossible, and large stacks should be laid on the edge. The pile can be kept level by making the layers so that the broad and narrow ends of the cakes are alternately in opposite directions.

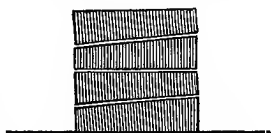


Fig. 1.—Method of Stacking Cakes

Cotton cake is most liable to ferment and mould. It is unwise to break up very large quantities of cake, as it heats so readily. If broken it should be left in a thin layer, and not be thrown up into a big heap.

Lameness.—When a stockman goes among animals he should notice that they are not lame, for lameness indicates many afflictions, such as foot-and-mouth disease, loup, a wound, or other ailment. In foot-and-mouth disease, the lameness is generally associated with frothing at the mouth: and if the tongue be examined it is found to be covered with blisters. Such a case must be at once reported to the police. Occasional doses of solutions of salicylic acid should be given, also mild purgatives; the feet should be cleaned, and dressed with salicylic acid, tan, or other disinfectant, but not irritant—a lotion of sulphate of zinc (2 drachms to a pint of water) is healing, and the animal must be isolated at once. Soft emulsive gruel should be given, as the mouth is too tender to allow

hard foods to be masticated. Lour is a swelling about the hoof, and is generally caused by foulness of lair, want of exercise, or general unhealthiness. The foot should be washed, and then dressed with green ointment. Ordinary lameness may be caused by a puncture; in such cases it should be washed with a disinfectant or antiseptic to clear it of foulness, and be bathed in warm water, and dressed with curative oils. If matter forms, the wound should be kept open for a time. Sprains should be well bathed and dressed with embrocation.

The Nose of a bullock should always be moist, covered with a dew-like moisture, as if it is dry it is a sign of feverishness.

The Coat should be smooth, but if it appears to have been licked it is a sign of health rather than of disease. A staring coat is a sign of chill, or of some other ailment.

The Dung should be fairly solid; if thin, it is probable that the food is not agreeing with the animal; an excess of roots, or of cake or meal is the usual cause, though a chill may conduce to it; the best method is to watch the animal, and withdraw a portion of the food most likely to have caused it. Newly ground meal, and other indigestible foods are liable to produce tympanitis or hoven, when the animal's stomach appears unduly distended, which causes evident pain, although when the case has been progressing for a long time the animal may appear listless. Gentle exercise is beneficial; a quart of linseed oil, or a dose of carbonate of ammonia may be

administered. If these do not bring about the desired effect, the trocar and cannula must be inserted; the method recommended for sheep under the same conditions being followed. The horns should be warm to the touch. The normal pulse is forty-five to fifty beats per minute. The eye should be bright.

Milk Fever.—To prevent milk fever, which is specially liable to affect old or fat cows, give a dose of Epsom salts, 2 lbs. treacle, 1 oz. ginger a day or two before parturition, and restrict the quantity of food. To prevent mammitis or garget, commonly spoken of as inflammation of the bag or udder, keep the cow warm, and carefully draw off the milk. The presence of the ailment is indicated by the heated, red, and hard condition of one or more of the quarters. Frequently draw off the milk, bathe with warm water, and apply iodine ointment. A dose of Epsom salts should be given occasionally to keep the bowels free.

Pigs are part of the care of the stockman. Store pigs are generally most profitable when they are allowed a fair amount of exercise, during which they act as scavengers, eating offal which they find lying about. Show pigs can hardly be called stores, because they are not kept in store condition, being highly fed, and usually housed. In-pig sows should have free opportunity to roam, as they are then better able to throw their young, and the young are usually stronger and healthier. If a small paddock is not at hand, they should be turned into a large open yard. When it is time for farrowing, the sow should be placed in a breeding pen, around the walls of which a rail is placed about 10 in. from the wall,

and the same height from the ground, so that she cannot squeeze the young pigs against the wall, and kill them by lying on them. She should not be fed too freely just previously to, or for two or three days after, farrowing. A thin bran mash is the safest food at this period. Afterwards a fuller diet will be required. The little pigs should be taken away when about seven or eight weeks old, and castrated a day or two previously. They require a small quantity of food as soon as they express a desire for it, which is usually at about the age of three weeks; but, if fed too freely on nitrogenous food, such as bran or skim milk whilst suckling, they are liable to become paralysed, when they lose the use of their legs, and probably die. Barley-meal is the safest and best food for them. Milk is most valuable as part of their diet after they are weaned; barley-meal and bran are the safest foods to give, with milk, at this time. The swill-tub, into which various kinds of refuse may be thrown, should be utilised for mixing the milk and meal in, for it is better for the pigs that the milk should be sour, and that the meal should be well soaked.

Cleanliness is absolutely essential for the well-being of young pigs, and the sties should be cleaned out and freshly littered daily.

Poultry is often left to the care of the stockman, and as he is about the yards at all times, he is able to exercise a watchful eye over them. The poultry houses should be kept clean, and the walls should be whitewashed once a year at least. Outlying eggs should be gathered frequently, as they are a temptation which many refuse to resist. Poultry should be persuaded to enter the house

when quite young, or they are troublesome to get together at night when older. A small quantity of corn daily thrown down near to the poultry house at roosting time is the best means of getting them into the neighbourhood of the house.

The stockman, being the man about the premises, should be responsible for the tidiness of the surroundings.

CHAPTER III.

DUTIES OF THE SHEPHERD.

THE welfare of the flock depends very much on the skill and care of the shepherd. He must be prepared to sacrifice his own rest for the good of the sheep when occasion demands it; as if he has not a love for animals he is very unlikely to be successful in his work.

Shearing is one important work which shows his dexterity. Fat sheep sent to market in a shorn condition often fetch at least two shillings per head more when well shorn than when they are turned out in a rough, unworkmanlike manner. Perfect shearing cannot be accomplished if the cutting is not done so that the shears *meet the wool* as it hangs on the sheep. For this reason, shearing which is done horizontally along the body of the animal cannot be perfect; it may be sufficient for colonial purposes where the work is done roughly; but where it is desired to take off all the wool and turn the sheep out smartly it is not enough. Before a man can shear well he must note the fall of the wool, so that he may understand how he is to cut it; he must also learn to hold the sheep so that he can work conveniently, and he must observe how differently the wool appears to lie on a sheep in the different positions it has to assume during the process, for when it is stretched out it is difficult for a beginner to realise the actual direction in which the wool falls.

The sheep should be placed on its rump, and held between the knees, the hand not holding the shears being free to assist around the neck. The head should first be trimmed, and the work continued down the neck. It is good experience for young shearers to be allowed to open the necks of sheep, for they so learn to hold a sheep and handle the shears, and if the work is not neatly done it does not appear unsightly except on close inspection. In rough shearing it is a common practice to open up the neck by cutting from the breast-bone to the jaw. If work, such as is required in shearing competitions, is desired, the wool under the throat should be laid open with the hands, the shears then inserted, and the cut directed so that when the animal stands in a natural position the marks are vertical to the ground. The right hand should cut upwards on the left side of the neck up to the spine, and the left hand cut on the right side, as the wool lies in these directions. In the position in which the sheep is usually held, the handle of the shears should be made to dip a little lower than the point.

The lower blade of the shears should be used as a guide, and also to open up a course through the wool; it should not be worked in the manner scissors are commonly used, but should remain in the same position, the upper blade being brought down upon it to effect a cut; if the lower blade is made to move up and down, a straight line of cut cannot be obtained. This blade should be nearly flat on the carcase, but the point may be very slightly raised. Unless the skin is very tight, the shears should be allowed to draw back a little after they are pushed forward for the fresh cut, otherwise the work will present a notched appearance. Except for trimming small loose locks in

difficult places, the cutting should never be done with the point of the shears, but two inches or more back according to the width of blow or stroke. If the point of the lower blade is held too closely to the skin, the skin is rased, and after the shearing is done, red lines, caused by irritation, are shown all over the body. Rasing is one of the points against which good judges of shearing most resolutely protest, for when the sheep are turned out they are very liable to be worried by flies, which can easily get at the blood.

Having opened the neck, the shoulders should be shorn, and a vertical stroke should be adopted. After this, the belly should be opened up ; and here again the lay of the wool should be observed, so that the cut may be made in accordance with it, and at the same time be so done that the strokes which go up the sides may fit in neatly. The under skin is very tender, especially on Down breeds, and is liable to be cut, therefore special care is required. Wool should never be lifted to permit the shears to catch it more easily, for sooner or later pieces of skin will be caught by the shears, and a sore place will form ; if there is difficulty in getting down to the wool, the skin should be drawn tight by pressure with the free hand, and the difficulty will be got over.

A good shearer is equally dexterous with either hand, but as most men work smarter with one hand, it is usually found advisable to cut with the less dexterous hand first, and shear the other side last. This is done so that the top of the back may be more neatly finished. A first class shearer not only makes the strokes from belly to backbone perfectly vertical, but he makes the strokes on one side meet those on the other exactly on the ridge of the back,

so that, instead of the strokes showing finishes on the back, the two form one continuous stroke right over the back. To insure the perfect clearing of the spine, the side cut first is usually extended slightly over the spine, and the last sidecut is run up to the spine. The neatness of finish along the top of the back is an important point in the eyes of judges.

The shearer bends down over the sheep until he gets to the flank, when he finds it more convenient to lay it at full length on the ground, and the hind quarter is finished in this position. The wool on the tail hangs in a slightly different direction, and should be cut accordingly. A few extra-narrow strokes on and above the tail add a smartness to the finish. After finishing one side, the other should be done. The legs, &c., should be trimmed up, and any cuts should be dressed with tar, or a healing ointment.

When shearing in competitions, the width of each blow or stroke should not exceed $\frac{3}{4}$ in., and $\frac{1}{2}$ in. is preferable, as this makes the smartest work. This may appear unnecessarily small and tedious, but it must be remembered that, if a man can shear a sheep in good style in the time allowed, he is sure to be able to shear quickly with a broader stroke when he is required to do so, as is sometimes the case with stock ewes which are to be kept on the farm.

The wool should be kept unbroken during shearing, and be carefully bound subsequently. Good binding or winding is important, as the wool is more convenient for "sorting" subsequently. The fleece should be laid out on the floor with the inside downwards; loose locks should be collected and placed on it; then, after folding in the sides, the whole should be rolled up into as compact and neat a

bundle as possible, and be tied by means of a band formed by pulling out and twisting part of the fleece for the purpose. Straw and dirt should be carefully kept out.

Washing Sheep.—There is great difference of opinion as to the advantage of washing sheep, but as a well-got-up article always sells best, an equally shrewd man would get as much for a clean clip throughout, as another man would for an unclean lot, and he would certainly have his sheep better clipped; therefore, it is found that the practice of washing still obtains, and so long as the sheep remain unshorn sufficiently long after washing to permit the yolk to get up again, the writer thinks it advisable to wash.

Trimming for Shows is special work. For this the shepherd must understand what are the valuable points of the breed he is managing; however, the main point is to procure a good outline and contour. Constant trimming tends to thicken the fleece, therefore the work is done at several times. It is usual on the first occasion to do little more than cut the wool on the backs so as to make them level. In the course of a week or two the animals are taken up again and more carefully trimmed, and the operation is repeated at intervals up to show time. The trimming is done by means of ordinary shears, but the woolsorter's comb is used for combing out rough pieces and to make the pile uniform. The backs of the sheep are repeatedly sprinkled with water to make the work more easy. The faces are trimmed by cutting, and misplaced tufts of coarse hair or wool are pulled out. It is necessary to have a rack into which the heads of the sheep may be fixed, or the work is done under awkward.

circumstances. The rack shown in the diagram is one commonly used on farms where much trimming is done. The sheep's head is placed between the up-rights, and is secured by an adjustable pin. The sheep are placed outside the rack.

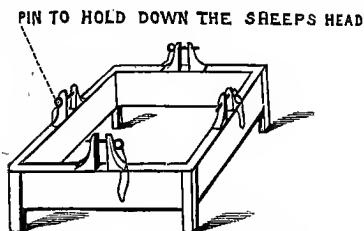


Fig. 2.—Sheep Trimming Rack (to hold four sheep at once).

Trimming for the Health of the Sheep consists chiefly of trim-

ming off foul locks around the tail, which, beside being unsightly, are prejudicial, as they cause a foulness attractive to the fly which lays the eggs producing the sheep maggot. It is necessary on some occasions to cut off locks of wool along the belly which have become smothered with dirt, as they chafe the sheep when moving.

Dressing to prevent and cure Foot Rot is one of the most important duties of the shepherd. Foot rot is a foul disease generally contagious, which affects the foot first between the claws, then, if neglected, spreads between the outer horn of the hoof and the foot separating them, and causing so much pain that the animal loses flesh very considerably. Foot rot affects feet, the skin of which between the claws has been ruptured from any cause whatever. Insufficient paring of the hoofs is a frequent cause of the disease establishing itself: if the hoofs become ragged they should be pared whenever an opportunity presents itself. Pieces of dirt or other matter lodged between the claws cause friction which predisposes the foot to disease. The disease yields to dressings of

mild caustics, but it is necessary that every particle of the diseased portion is dressed, otherwise when new horn is formed the disease will be covered in, and will break out subsequently in such a bad form that the greater part of the hoof will be lost. When dressing to cure foot rot it is necessary to cut off the horny part of the hoof until the sound hoof can be seen; any part of the horn which does not fit closely to the hoof has been loosened by disease. A very sharp knife should be used. Those made by Macklin, of Salisbury, are the best foot rot knives we have used.

Sheep Dipping has now become a common practice, and, owing to the extent to which it is carried out, scab and many other skin diseases and parasites are kept in subjection. Lambs should be dipped as soon as weaned, and again in autumn. Ewes and other sheep should be dipped after the wool has grown sufficiently to retain a fair quantity of dressing. This will destroy ticks and lice, and prevent to a great extent injury from maggot, as the fly, which lays the egg, will not so readily lay its eggs where the wool has been made obnoxious to it by the dressing. If sheep are struck by maggots they should be dressed with the Fly Oil, which is the most expeditious and safest remedy we know. A small quantity poured on and rubbed among the maggots will make them fall off at once. A stricken sheep will often draw away from the rest of the flock; in fact, it may be taken as a safe axiom that whenever a sheep strays from its companions it is not in a healthy condition, and consequently requires the shepherd's attention.

In summer time, or whenever the sheep are grazing, the

shepherd should send his dog round the field as soon as he reaches it, to see if there are any sheep drawn away from the rest. In winter time, when on roots, or elsewhere, he should consider it his first duty to look out for any that hang back, especially those which do not come up to the corn trough when the corn is served out.

The Duties in the Lambing Pen consist first of arranging the yard so that there are compartments into which the ewes in different condition can be placed; they will thus be better under his control in case of a special rush of lambs. The ewes should be drawn out so that those which appear likely to lamb first may be placed in a section by themselves. He should provide himself with carbolic acid or Condyl's fluid, or some other convenient disinfectant, which is suitable for the purpose of washing his hands after assisting ewes to lamb, particularly if the ewes have brought forth dead lambs, or there are signs of fever, gangrene, or other contagious disease; also for inserting into the ewe after delivery of a dead lamb. Some healing oils should also be at hand for dressing internal or external wounds. A tonic, such as is provided in some of the special preparations for ewes, should be purchased, so that there may be a stimulant at hand to support the ewes if they are much pulled down by lambing.

When the lambing begins he must be prepared to be with the ewes at all times to give assistance to them in their labour, though it is a mistake to interfere with the course of nature unless it is seen that there is absolute need for it; but he may be required to make the lambs suckle. The young lamb should come away from its mother easily, and if it is presented with both fore feet

and the nose showing there is little cause—except with young ewes—to give help. If the presentation does not take this form it is a sign that something is wrong: it may be one or both legs, or the head itself, is bent back; which it is can be ascertained by feeling, and the lamb must be shoved back so as to give room for the limb to put into the proper position. The lamb may be on its back, and will have to be turned over; or it may be a tail presentation, the lamb coming tail foremost, when much skill will be required to get it away, and probably it will have to be taken out piece by piece to save the ewe's life. After any of these abnormal deliveries a small quantity of healing oil should be inserted, and the parts should be washed with a solution containing a disinfectant.

If the newly born lamb cannot breathe because of a film over its nostrils, this should be cleared away with the finger, and the nostrils may be blown down. If very weakly, the shepherd should induce it to suckle by milking a small quantity of milk into its mouth, and allow it to suckle his own fingers at the same time; it will soon learn to suckle of its own accord. Lambs should be kept dry. No matter where placed, shelter should be

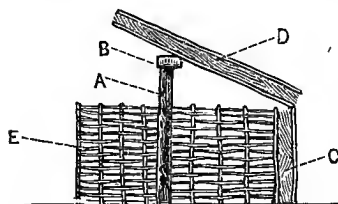


Fig. 3.—Section of row of sheep-shelters as made in Wilts.

set up where they can escape from wet. The best temporary shelters are made on the sheep farms on the Wilts and Hants Downs. A double line of ordinary hurdles, stuffed with straw, break the wind and afford fair shelter.

The moveable sheep-yards of Wilts are placed in open

fields. A hilly field, facing the south, is chosen, and a line of shelter-hurdles is placed along the top or north side.

A stout fir post (A) is driven firmly into the ground every five or six yards, and these are tied by means of rough fir rails (B) nailed along the tops; a line of hurdles is set up at (C) parallel to the line of posts, and another line of hurdles is laid flat behind these; a layer of straw is laid upon this row of hurdles, and the hurdles are then lifted and secured so as to stand immediately behind the first row; the straw is thus packed closely between them and forms a protection along this side. Another row of hurdles (D) is laid lengthwise from the standing row to the rail, and are thus supported. Straw is strewn on these, and another layer of hurdles is fitted on to that, which, when secured, forms a sound roof. If it is desired to form small pens for individual ewes and lambs, hurdles are placed as at (E) every six feet, and these may be shut off from the yard by another line of hurdles placed in front. The whole yard often enclosing more than an acre, and divided into numerous sections is fenced around in this way. The posts and rails are serviceable for several years if properly taken care of, and it is safe to say that no more economical or convenient yard is made.

The yards should be kept clean by frequent littering with straw, otherwise the ewes and lambs will contract lameness, and it is advisable to turn the ewes out as soon as possible, at any rate for some portion of the day, so that the feet may be kept healthy.

It is advisable to shorten the tails and castrate the lambs before they are a month old, as there is less risk in doing it then than later. The shepherd should brand

his sheep soon that he may know them. Marking may be done by ear marks, pitch branding on the wool, or more temporarily by ochre and oil marks. The flock should be counted frequently, and a record of deaths or sales be kept. No sheep should be allowed to die a natural death; if a sheep is so bad that there is no chance of its recovery, it should be killed at once so that it may lose no more 'flesh, and the skin and carcase should be disposed of without loss of time. Special care should be taken to see that hurdles are secure during the break up of a frost, and after heavy rains, following a period when the ground has become hard through drought, for at such times they are very liable to be blown or knocked down. Troughs in which corn or other food is given should be moved on to fresh ground daily, in order that the manure may be evenly distributed; after use the corn troughs should be overturned, so that water may not lodge in them.

Dry food should be given at all seasons when sheep can be made to eat it. Great loss occurs through not commencing to give dry food sufficiently early in autumn. It is especially necessary, early in the autumn, to prevent scour, as roots are often in an unripe and indigestible condition. When close-folding on roots, sufficient fall-back should be allowed, so that the sheep may have a dry lair. When feeding young and very succulent clovers the sheep should be turned in with a full belly, otherwise they eat so ravenously that they become blown or hoven, which results from too rapid feeding, causing the food to ferment instead of digest; large quantities of gas are given off, which frequently distends the stomach so much that it ruptures, and the sheep dies. If any sheep shows

signs of blowing, the flock should be at once taken away ; gentle exercise is usually sufficient, but if there is a very bad case, the stomach should be punctured. This is best done by means of a trocar and cannula, which are driven into the side of the stomach. The left side of the sheep only may be punctured, and the point to insert is that equidistant from the hip-bone, the last rib, and the lateral processes of the backbone. The direction of the thrust should not be horizontal or vertical but between the two. The trocar must be withdrawn and the cannula will remain, and it should be fastened, so as to remain until the gas has all gone off.

When hoven becomes chronic in a sheep, half a pint of linseed oil should be administered when signs of distress are apparent ; and in very perverse cases half an ounce of aromatic spirits of ammonia, well mixed with a pint of warm water, will usually prove effective.



Fig. 4. — Trocar and Cannula.

Husk or Hoose, caused by a small eel-like worm which infects the throats of sheep which are kept on wet pastures in early autumn, is often very troublesome. The pastures should be drained, and occasionally dressed with lime and salt, especially during the months of July, August, and September. The shepherd's particular duty is to keep up the strength of the sheep so that they may have strength to resist the attack. Wet pastures should not be fed off by sheep in the latter part of summer or autumn, as the sheep are liable to be attacked by the

liver fluke. The same treatment which prevents husk is efficacious in the case of fluke. Sheep should always be provided with a block of rock salt to lick.

It is very important to keep sheep dogs free from worms, as the tape worm is one stage in the life of the worm which gets into the brain of sheep causing gid or sturdy. If dogs are suspected of worms, and young dogs generally contain them, an occasional dose of $\frac{1}{2}$ to 1 drachm of areca nut should be given to the dog on an empty stomach. The dog should be kept shut up until the worms are passed, and the droppings should be burned. Dogs should not be allowed to eat raw sheep's head. The worm causing gid may be cut out, but the operation should not be attempted until the operator has at least seen it done once by an experienced hand.

Other Duties.—In some districts the shepherd undertakes the duties of working bailiff or foreman. This is not often convenient on strictly arable farms, but is adapted to grass farms where the shepherd's duties are not so heavy. Men who aspire to the post must be good, all-round men, well-posted in the general work of the farm, in addition to their special duties as shepherds. It is particularly necessary that they should develop their powers of observation, as a man is a failure as a farmer or foreman if he does not keenly observe all the changes and requirements on the farm.

The shepherd should be able to mend hurdles, broken fences, troughs, and perform the work of a rough carpenter. He should also be able to kill vermin, for as he is constantly moving about he has an opportunity to attend to these duties whilst going from place to place.

CHAPTER IV.

DUTIES OF THE ENGINE-DRIVER.

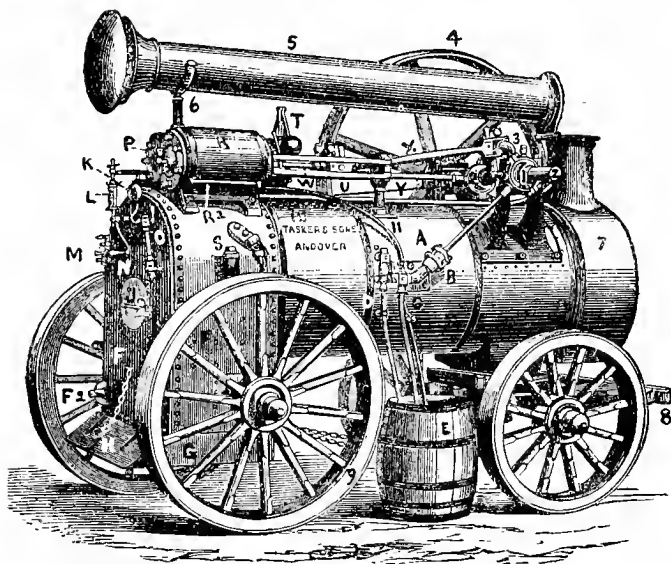


Fig. 5.—Portable Steam Engine.

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| <i>A.</i> Boiler. | <i>S.</i> Funnel holder to fill boiler. |
| <i>B.</i> Pump. | <i>T.</i> Governor. |
| <i>C.</i> Suction pipe of do. | <i>U.</i> Slide and guides to piston rod. |
| <i>D.</i> Exhaust pipe of do. | <i>W.</i> Piston rod. |
| <i>E.</i> Water tank. | <i>X.</i> Piston connecting rod. |
| <i>F. F.</i> Fire box. | <i>Y.</i> Eccentric rod. |
| <i>F₂.</i> Mud port. | <i>Z.</i> Main crank shaft carrying (1) Pump eccentric; (2) Steam eccentric; (3) Piston crank. |
| <i>G.</i> Ash pan. | <i>4.</i> Fly-wheel and driving wheel. |
| <i>H.</i> Ash pan lid. | <i>5.</i> Chimney, or funnel. |
| <i>J.</i> Firebox door. | <i>6.</i> Chimney bracket. |
| <i>K.</i> Steam gauge. | <i>7.</i> Soot box. |
| <i>L.</i> Spring balance safety valve. | <i>8.</i> Fore carriage and wheels. |
| <i>M.</i> Water and steam cocks. | <i>9.</i> Hind wheels. |
| <i>N.</i> Driving lever. | <i>10.</i> Exhaust pipe. A branch of which, 11, is conducted to the water tank to warm the water. |
| <i>O.</i> Water gauge. | |
| <i>P.</i> Steam chest. | |
| <i>R.</i> Cylinder. | |
| <i>R₂.</i> Cylinder relief cocks. | |

THE MANAGEMENT OF THE ENGINE.

ON railways it is the practice to make a man pass through the stages of engine-cleaner and stoker before he is allowed to become a driver ; in this way he becomes thoroughly acquainted with every part of the engine before he undertakes the full responsibility of its management. Less care is taken in the training of farm engine-drivers, with the result that in a very short time the engine becomes worthless, or so much out of repair that an enormous sum has to be expended upon it to make it fit for work again.

The illustration in Fig. 5 represents Messrs. Tasker's portable engine, which is the type of engine most commonly found on the farm. Although only one side is shown, all the more important parts are plainly discernable, and the student may by its aid identify them. The parts not plainly shown are the whistle, the manhole, and the Government safety-valve. The whistle is a very small brass fitting, and is always placed near the back of the machine ; it connects with the boiler, and detonates when, by turning a handle, the steam rushes into it. It is not likely to cause the driver trouble. The manhole is placed in the dome of the fire-box, and is a large opening, which is convenient for cleaning out the boiler, or for repairing parts near. It should not be opened too freely, as trouble often arises in getting the lid securely fastened. To prevent leakage of steam, the lid must be well packed, and the joint made perfect by red-lead. The Government safety-valve is purposely not under the control of the engine-driver ; it is meant to control him. The gauge is set at a point considered safe by the inspector of machines, and if

steam attains a greater pressure the valve opens and allows the steam to escape. A cover is placed over it and locked securely. The owner of the machine holds the key, and it is illegal for him to give it up to the driver. The inside parts, which are few in number, will be described, in passing.

With this introduction we come to the parts discernible on the outside. The object to attain is to make the fly-wheel turn. To do this water is placed in the boiler, and a fire is lighted in the fire-box; steam is generated, controlled, and guided from the boiler through the steam chest into the cylinder, where it drives against the piston and forces it along; this moves the shaft, with which it is connected, and the whole machine is in motion.

Water lies inside the engine from the soot-box to the back end of the fire-box, and is heated, first, directly from the body of heat in the fire-box—for the water lies around and above the fire-box; and less directly from the heat which is conveyed through the pipes inside the boiler. The pipes which run from the fire-box to the soot-box convey the heat and smoke towards the chimney, heating the water which lies around them. As there are many tubes the engines are called multitubular. The boilers of these engines differ from those which are imbedded in cement, for in these there is sometimes only one flue running the whole length of the boiler, the fire being burned in it; these are called Cornish boilers. In others there are two of these flues, and they are called Lancashire boilers.

If the boiler is empty the water must be passed into it through the part (S), a funnel being placed in it to conduct

it more readily; if the fire were lighted whilst the boiler was empty the fire-box would burst. When the engine is supplied with water, and sufficient steam has been generated to drive it, the supply is maintained through the force pump (B). When steam is up—that is, when sufficient steam has been generated to exert a palpable pressure on the boiler, which is indicated by the steam gauge (K)—the engine may be set in motion, though the pressure required of course varies with the amount of work to be done. The steam now lies within the chamber formed by the boiler and the space around the fire-box, and it exerts practically the same pressure on all parts, for it is the same where the water lies as at the parts where it does not touch; consequently, if gauges communicating directly with the boiler are attached, they will register the same pressure at any point. Thus, all the gauges should agree. If they differ, the driver should suspect each one of error until he is satisfied.

To set the machine in motion the steam must be conducted from the boiler to the cylinder; and although there are points at which the steam may be shut off, when the steam exerts its influence on the piston-head within the cylinder the pressure is continuous from the boiler to it.

The first opening is from the boiler to the steam-chest, where a narrow slot is found allowing the steam to pass up a short, narrow cylindrical tube to the steam-chest. The steam-chest (P) is an oblong box lying alongside the cylinder (R), and the steam leaves the steam-chest for the cylinder through two ports, which are used alternately for the forward and backward stroke of the piston.

A rather more detailed description of the process is

necessary for the passage of the steam to be understood. When the driver moves the driving lever, he uncovers the slot or port which opens from the boiler to the cylindrical tube, and the steam rushes through it, and unless the machine is travelling at too great speed it rushes unimpeded to the steam-chest; but if the machine is running at too great speed a self-acting valve placed at the top of the tube, and called the stop-valve, closes, so that, although the driver is allowing the steam to leave the boiler, the engine itself cuts off the supply to the steam-chest. This is called the throttle-valve.

The throttle-valve is ingeniously made to close by the governor (T). The governor is constructed so that when the heavy weights, which are suspended and hinged from the top of a standard, are raised, a cranked rod is made to turn; as this rod is fitted with a piece of metal which on turning blocks up the channel from the boiler to the steam-chest, the steam is arrested until the governor falls again and opens the channel afresh. The governor is driven by a strap from the main shaft, and the weights are turned round. On the principle that a weight, such as a stone attached to a piece of string, flies outwards and upwards as it is swung round, the weights rise and fall in accordance with the pace at which they are driven. This is known as centrifugal force, as the force, as it were, flies from the centre. When the stop valve and the throttle-valve are open the steam is continuous from the boiler to the steam-chest.

The steam is conducted from the steam-chest to the cylinder through two slots controlled by the D-valve or slide valve. If the inside face of the steam-chest next to the cylinder is examined it is seen to be upright, but in the

centre are three vertical slots or ports, and the steam passes from the steam-chest through the two outside slots ; but the steam cannot pass through these two slots at the same time. Fitting over the slots is a piece of metal, nearly square, but rising somewhat D, or dome-shaped, in the middle, but flat on all four of the sides ; this is called the D-valve or slide valve, and is connected with the eccentric-rod (Y), which is attached to the main shaft. The eccentric causes the eccentric-rod to move to and fro when the engine is in motion, and as it moves the D-valve covers and uncovers the two outside ports or slots alternately.

The ports connect—one with the fore-end, and the other with the back-end of the cylinder. The steam passing through the back port is conveyed by a tube to the back-end of the cylinder, where it exerts its power on the piston head, and shoves it to the other end ; but whilst the piston is moving forward, the slide-valve comes back, covering the back port, cutting off the steam, but opening the fore port and allowing the steam to pass through, and down a tube to the fore port of the cylinder, where it sends back the piston. A backward and forward motion is thus obtained, and the main crank, therefore the whole engine, is set in motion.

But it has not been explained what became of the used or exhausted steam. When the slide-valve gets to a certain position both outside ports are closed, and no steam enters the cylinder—this is called “the dead point” ; on the other hand, the exhausted steam rushes back down the same tube it entered the cylinder, but cannot get back to the steam-chest, as both outside ports are closed. However, the steam rushes out of the middle port into a tube,

called the exhaust-pipe (10), which runs from thence to the chimney, being permitted to do this by the dome shape of the slide-valve. The exhaust steam is sometimes utilised to heat the water in the water-tank, being conducted to it by a branch exhaust-pipe (11).

Whilst the piston-rod is moving forward the eccentric-rod seems to be moving backward. However, this is not exactly the case, though, to the casual observer, it appears so. The eccentric-rod commences its return journey slightly before the piston.

The fly-wheel shown in the illustration acts as driving-wheel. The fly-wheel is intentionally made heavy, so that it may act as a reservoir of force to sustain motion when the dead point is reached. If some momentum were not provided the machine would come to a standstill each time it came to the dead point. The manner in which a wheel is a reservoir of force is understood when it is remembered that a force is required to make a wheel revolve, and also, that when it has gained an impetus, force is required to stop it. It stores up force within itself, and is thus a reservoir of force.

PRACTICAL DUTIES OF THE ENGINE DRIVER.

Having described the manner in which the engine is made to perform its work, other details can be explained while dealing with the practical duties of the engine driver.

Before taking other steps the driver should see that all parts are safely keyed and otherwise securely fixed in their places. The boiler tubes should be swept out cleanly, as an accumulation of soot in them prevents the heat from reaching the water lying around them, and also

checks the draught, causing the fire to burn slowly. The mud should be scraped out of the boiler at the bottom of the fire-box. If the bottom of the fire-box is examined it will be seen that there are three ports similar to the one shown at (F_2). These are placed so that all the mud which has collected may be drawn out by means of a mud hoe. Sediment collects here because it is the lowest part of the boiler. If it is not cleaned out there is danger of the fire-box being burned out. In case it is desired to let out the water from the boiler whilst it is hot, there is a tap, called the blow-off cock, which should be used, as the driver would be injured by the steam if he opened the mud ports on such occasions.

Having looked to the above matters, which should be done some time before the engine is required, the driver should see that the boiler contains sufficient water. The gauge (O) should indicate the height of the water, but it is possible to mistake a line of dirt for the water-line. So, to prevent error, the lower of the water and steam cocks (M) should be turned, and, if water passes out, there is sufficient to render it safe to light the fire. Whilst the steam is up, steam should blow out of the upper cock (M), and water should run out of the lower cock (M), when the handles are turned on, as it is proof that water lies between them, and that is the proper height at which to keep it. A tap affixed to the exhaust pipe (D) controls the supply of water to the engine. The pump is always in action whilst the engine is in motion; but if there is sufficient in the boiler, all the water may be conducted to the water exhaust pipe (D), and so back to the tank; or a portion may be passed into the boiler, and part be turned again to the tank. Where the work

is even, a good stoker controls his firing so well that, after setting his tap once, he rarely has to alter it during the day; but a novice experiences considerable difficulty before he gains this skill.

Having seen that the fire-bars are not choked by clinkers, the driver may lay the fire. Many farm fires and other accidents have occurred through the firing being laid shortly after the fires have been put out. Drivers are apt to do this, as the warmth dries the fuel and saves them trouble in the morning; but, considering the risks, it should not be permitted.

On starting the engine the driver must see that the fly-wheel is not standing at the "dead" point, or he cannot get the steam into the cylinder. He must put it into proper position before turning on the steam. The cylinder relief cocks (R_2) should be opened at starting, so that any steam which may have condensed may be blown out, or the action of the piston will be impeded. If during work steam condenses, these cocks should be occasionally opened. If the water rises too high in the boiler it may be sucked by the different valves into the cylinder; and sometimes, when the engine is low in steam, and doing heavy work, it sucks in moisture, and seriously impedes the working of the piston. These actions are known as "priming," and means must be taken to lower the water, or get up more steam, as the case demands. The great hindrance is due to the slow rate of escape into the exhaust-pipe of moist steam or water as compared with dry steam, which disappears through the exhaust port almost instantaneously when it is opened. Another way in which the piston's action is checked is when the cylinder is worn, or the piston-head is out of order, so

that steam escapes between the two ; the force of the stroke is lessened, and, perhaps, some of the escaped steam may act as a resistance instead of an assistance. If this occurs, the driver should inform his employer of it. It may occur through bad workmanship and bad fitting of the spring-rings around the piston-head, or from too much play being allowed between the slide and guides (U).

The management of the fire requires both skill and care on the part of the driver. For not only is the engine less injured, but the consumption of fuel is not nearly so great when the firing is well managed as when ignorance is displayed. The driver should manage his fire so that he maintains a uniform pressure of steam. While the engine is running occasional shovelfuls of coals should be put on to the fire, and if the water is kept at uniform height little trouble need be experienced. The driver must avoid having too little fire and too much water, as the steam cannot be generated fast enough to keep the engine running ; hence the fire must be increased. But too little fire and too little water are a still worse combination, as both have to be increased. Too much fire and too little water are dangerous, as the water may all become converted into steam, and the engine be burst ; at any rate when a large quantity of water is pumped in the temperature will fall, and cause a temporary hindrance. A too big fire and too much water generate too much steam, causing waste, and, if the safety valves are not reliable, may cause the boiler to burst.

The trouble is caused during unexpected stoppages as there is a sudden cessation of requirement for steam. Yet it must be generated. The fire should be damped

down as much as possible by closing the ash-pan lid (H) to prevent the air from passing through the fire. The fire-box door (J) may be slightly opened to allow a draught of cold air to blow on to the pipes if there is serious need, but as the sudden exposure to cold is liable to do great injury to the fire-box and boiler this should be avoided generally. If the steam is too high the safety-valves should be loosened, so as to give the superfluous steam an opportunity for rapid exit.

When stopping at meal-times a good supply of water should be pumped in, and the fire should be banked so that it consumes slowly. The body of heat in the large quantity of water will be such, that when the fire is opened out and fresh fuel is added the steam will quickly rise. The fire-bars should be kept clear, so that the passage of the air is not impeded. Some coals form clinkers very readily, and cause the driver much trouble. When putting out the fire at night care should be taken that the bars are clear. It is advisable to keep a little water in the ashpan (G), as sparks are thus destroyed at once.

The driver should pay strict attention to oiling; avoiding waste of oil, on the one hand, he should never allow a bearing to run hot on the other. Every part should be kept clean; and if a bearing becomes loose, or a pulley is in the slightest degree out of order, no time should be lost in getting it into proper repair.

Serious accidents have been occasioned by carelessness on the part of the driver, or other person, through hanging some weighty article on the lever of the spring balance safety-valve, whereby the valve has been rendered ineffective. This should be carefully guarded against.

CHAPTER V.

HAYMAKING.

THE endeavour in haymaking is to collect the herbage so that it may be stored dry for winter use with as little loss of feeding matter as possible. Haymaking is a simple process in fine weather, but even then it may not be accomplished to the best effect, unless it is properly managed ; however, the greatest difficulty is to counteract the injurious effect of wet weather, and sound methods must be adopted to insure this.

Cutting.—Grass fields should be cut before the herbage is too ripe, and the best guide is the condition of the flowering heads of the grasses ; these should be well up, but the seed should not be ripe. Some judgment, however, should be exercised with respect to the nature of the grasses, for if the bulk of the grasses are of late varieties these should be allowed to become well developed, and the earlier varieties may be allowed to seed ; such instances are, generally, the exception. It must not be forgotten that if the weather is persistently wet, grasses suffer far less by becoming over-ripe than by being cut when in their most nutritious stage ; therefore, only so much grass should be cut as can be managed by the staff at command. Immense quantities of hay are ruined in every wet season on account of too much being exposed to the influence of the bad weather, which,

had it been left standing, might have been gathered in and converted into valuable winter fodder.

Mowing Machine.—The introduction of the mowing machine to cut grass, of the tedder to toss, of the hay-rake to collect, and the hay-loader to put it on carts, has very much altered the manner of making hay, which previously was entirely made by hand-labour. Still, there are many acres on small holdings which are made by hand-labour, and the oft-quoted account of the Middlesex system of haymaking as drawn up by Mr. Middleton, in his report on the Agriculture of Middlesex at the commencement of the century, has never been surpassed. But an account of the best method of making hay by the aid of machinery is valuable now, because in so many districts haymaking is conducted in a very inefficient manner.

It is always advisable to send two hands into the field with a mowing machine, so that with two sets of horses the cutting may be kept on without interruption throughout the day, meal-times not excepted, as, by taking their meals at different times, one man can always be on the machine. The other man can be well employed in sharpening knives, feeding horses, mowing round corners, and cutting out odd pieces beside fences which are risky to attempt with the machine. If the corners are kept well rounded, so that the horses have not to stop and back at each corner, as much more cutting may be done in a day as in itself will pay for the extra-hand. The knife sharpener should be provided with a stand in which to place his knives while sharpening, and if he has also a knife-sharpening machine, his work will be done more

expeditiously and probably better than by files. Whether the work is done by a machine or file, care must be taken to keep a broad bevel on the sections: the bevel should never be made narrower than the makers turn it out.

Operations by Manual Labour.—The operations carried out by manual labour in the hayfield are: mowing, tedding, hacking, raking, turning, winrowing or putting in, cocking or pooking, and loading.

The Scythe.—When mowing, the scythe should be set in accordance with the work to be done. When mowing grass the blade should be laid so that when a man is in a convenient position to take his swing it is flat on the ground. It must also be set so that the man can control the swing; the same depth of cut may then be made throughout the stroke; if the blade is set at too wide an angle to the snath or long handle it will tend to run too deep or too far into the standing crop; if placed

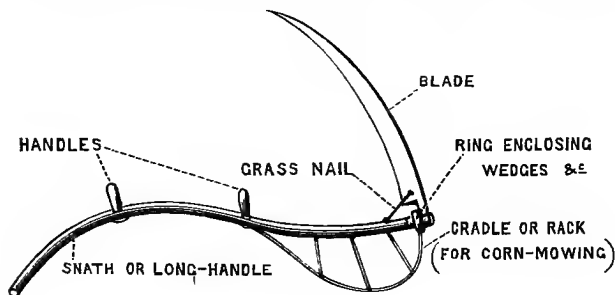


Fig. 6.—The Scythe.

at too narrow an angle the blade will tend to run out too soon, and the width of the swath will be too little.

For grass mowing it is generally found that the most convenient angle is that which the mower finds by holding the scythe in front of him with the bottom of the long handle on the ground. Then reaching out with his left foot as far as he can, the point of his toe just reaches the point of the scythe. The alteration of the setting is effected by means of leather pads and iron wedges which always accompany a scythe; these and the crank of the blade are placed inside a stout ring which, when the wedges are driven tight, holds all fast to the long handle. For corn mowing which need not be done so closely to the ground, the blade need not lie so flat on the ground, and the blade may be laid at a wider angle. Sharpening a scythe is not an easy matter to the beginner. It first requires grinding on a grind-stone, and then whetting with a small finely-grained whetstone or rubber. The first essential is an edge with a long bevel, otherwise it will require repeated whetting, for work with a blunt scythe is most arduous. The stone should be laid flat on the blade, and drawn forward along each side of the blade alternately. However, the best grass mowers generally give a double rub, backward and forwards, on each side alternately; if great skill is not possessed the edge is knocked back, so the single stroke is most common. The scythe blade should be held firm, but the stone, though firmly gripped between thumb and finger, should be allowed a certain amount of play. The points in mowing are to lay the blade in flat, and make the stroke so that the cut is level throughout; there should be no ridges between the strokes, and no ridges between the swathes. The mower should stand nearest to the cut side of the swath which he is mowing, his body should face in

the direction he wishes to travel, but his left leg should be a few inches behind his right, and the legs should not be less than 2 feet apart. If he then lays in his scythe as far back as he can conveniently reach, and swings it round in front of him properly, he will make the cut as it should be done. The mower must remember that he is cutting with the blade and not with the end of the handle, therefore he must make the sweep in accordance with the angle at which the blade lies. No one but those who have taught others know how difficult it is to make a beginner realise this; however, the lesson is learned as soon as the pupil can be induced to bring his right hand sharply and closely round the left knee. The right hand should commence some inches to the right of the right leg, and finish close to the left side of the left knee. He must also remember to keep the left handle well up in the air, otherwise he will be digging the ground with the point. By bringing the scythe sharply round to the left the greatest amount of strength can be thrown into the end of the stroke, where it is most required; it also permits the cut being pointed out or cleared. The early part of the stroke is easily made because there is no weight on it, therefore, there is no need to give the hacking stroke which bad mowers practice; when a stroke commences with a hack the cut is not made horizontally, consequently more stubble is left than is desirable, and the man following has to mow it again or leave it in a high ridge. The stroke should be horizontal from start to finish; therefore the heel of the blade must be kept low, the upper handle high, and the right hand must be swung circularly, finishing close to the left knee.

Tedding is the throwing out of the grass behind the scythe so that the wads, or compact bunches, may be broken, and thus spread evenly about the ground to ensure the whole of the grass being brought under the drying influence of the sun and wind. A light two-tined fork is best suited to the work, and it should be worked lightly and freely, so that the action may be unimpeded by either of the tines striking into the ground. Each piece picked up should be tossed into the air, a turn being given to the wrist to break the mass and allow it to fall lightly.

Hacking.—After the hay has been exposed to the weather for some hours, so that it feels light and dry, when handled by the fork, it requires hacking, which is usually quicker performed by a rake, though a dexterous hand with the fork can, by a sweeping action, make hacks, which are rows of grass containing the grass from two or three scythe swathes, and which are more lightly put together by the fork.

The Rake should not be used as though it were a hoe, which is worked with a chopping action. The handle of the rake should lie in the palms of the hands, and not be grasped like a fork or hoe. The upper hand should retain its hold at all times, but the under hand should act as a bearing through which the handle can run whilst being thrust from the body, and, to a less extent, whilst the return stroke is being made. If the rake is used in this manner, the tines will be less liable to become caught in the ground; the grass will hack in more lightly; and the work will be more expeditiously

performed. The illustration shows the correct angle for the teeth to strike the ground when commencing the stroke; and, as the handle becomes more vertical as it



Fig. 7.—Rake with Steel Wire Teeth.

is drawn to the body, the teeth lie flatter on the ground. The adoption of light steel wire teeth has resulted in a much-improved rake for the general purposes of the farm. The hacks may be turned by the rake or fork. The fork is usually preferable, as an opportunity is afforded to give extra green, or solid pieces, a special shake, and to lay them on the top, so that they may get the fullest advantage of the weather.

These green locks, if not specially treated, are the most frequent

cause of mouldy patches in hay-stacks, and in all operations in the hay-field they require to be looked after with the greatest care. Two, three, or more hacks are subsequently worked so that they are made into one, when it is usual to call it a broad hack, and when this hack is worked into as narrow a space as is convenient it forms a winrow or windrow. When once the grass is gathered into the broad hack it is not allowed to spread over the whole of the ground again, as it is then said to be "in hand." When hay is in hand it is recognised that with care and judgment there need be little fear of injury from wet weather, for it is in a condition which allows it to be run up into heaps or cocks, where, excepting a small portion on the outside of each

cock, it is protected. In all weathers it is advisable to put it into the cock at night, or on the approach of wet weather, and not to throw out more than can be got together again should fine weather give way to wet. It is owing to disregard of this one point that so much hay is spoiled in the field.

The grass in the broad hacks should be shaken up occasionally by the fork, and during this operation the leaves should be turned so that each two rows are at a convenient distance for the cart to run between them when the hay is fit to carry or load.

Turning In.—When the hacks are considered nearly dry enough to be carried, they require “turning in”; that is, they should be rolled into a windrow, special care being taken during the operation that the windrows are formed so as to be in the most convenient position for the pitcher to pick up with the fork; for hay is more easily pitched from windrows than from heaps. Two hands working simultaneously perform the putting in in the best manner. One should work from the left, the other from the right, each making a semi-circular sweep with the fork so that the grass is brought into a narrow row between them. Great care should be taken that there is a clear space between the hack and the windrow, as then there is no doubt that each piece of grass is mowed. It is not sufficient that the grass is shoved up into a narrow line, it must be worked so that each small forkful is packed behind the preceding one, or when the pitcher attempts to shove the row along to gather a large forkful it will break from the sides, and give extra trouble to pick it up. Putting in is very commonly badly done, and much

hindrance is thus caused. The pitcher should use his fork dexterously to gather in small pieces which have previously fallen from his fork, and should then place the fork well in the centre of the windrow and shove the row into as big a heap as he can hold on the fork. The other part of his work is best performed in accordance with the subsequent advice as to the method of loading a cart.

The hand-drag was the forerunner of the modern horse-drag. It differs in its action in that instead of the tines being

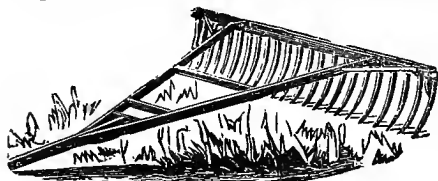


Fig. 8.—Hand Drag Rake.

lifted out of the material when being emptied the whole rake is pushed back to clear the tines.

The handle should

be held almost vertical, as the tines do not then run into the ground, and the work is better done. Its chief uses are for collecting strewn pieces of grass where the hacks are put up into small cocks in the field, thereby preventing these pieces from being damaged by rain should it fall; and also for raking behind carts when they are being loaded in the field with either hay or corn.

Clover Hay requires different treatment to grass or meadow hay. The leaves of clover form a valuable portion of the crop, and an endeavour must be made to keep them on; for this reason it must not be shaken out or teded, but be turned over with a rake or fork. It may require turning twice or oftener, according to the drying properties of the weather.

CHAPTER VI.

HARVEST OPERATIONS ; THRESHING, &C.

Reaping Machines and Mowing Machines.—

The great variety of mowing, reaping, and binding machines renders it impossible to describe all their parts and principles in this handbook. There are points, however, connected with their management which may be recorded. Three matters, which have very much to do with the successful working of these machines, are: to have them overhauled sometime before they are required to see that the parts and bearings are in good order; to oil and clean the machines as soon as the season's cutting is done, and then to store them away until the next season. When in use the knives must be kept sharpened, as less strain is thrown on all working parts when cutting is done easily, and the draught is also lighter. The blades or sections of the knife should be firmly riveted, and a long bevel kept when sharpening. The bevel should at all times be kept as long as when it is sent out by the makers. Knife-sharpening machines do the best work; but a file answers sufficiently well in good hands. In using the file it should be laid flat on the bevel, and worked outwards from the section, and slightly forward. The machine should be kept well oiled. Many of the parts have very rapid motion when in work, and these must be kept constantly lubricated. The simple and easily

worked levers which are fitted to modern machines, make the work of driving very easy, as with the levers in a convenient position there is little trouble in making necessary adjustments. The driver should be on the alert to notice any unusual rattle or noise, and should at once stop and remedy the defect. Binding machines, which bind the sheaf as well as cut the crop, possess more parts than ordinary machines; but the additional parts are confined to the binding apparatus. These machines are in a transition stage. Most of those in use are made with vertical and horizontal aprons for carrying the corn from the knives to the binder; however, the vertical aprons are being dispensed with in the more modern machines, rendering the work much less complicated, and the parts fewer. In the ordinary machines the grain is carried over the driving wheel by means of the canvas aprons, which deliver it to an incline, down which it falls, until stopped by a lever, which temporarily stays its progress. Here a sheaf is collected. The lever yields to a given pressure, and sets the binding apparatus in gear. A curved arm, fitted with a needle threaded with twine, rises from beneath the incline, and encircles the sheaf, leaving the end in the grasp of the knotter, which completes the binding. The twine is cut as soon as the knot is tied, and two arms thrust it away from the knotter, and it falls on the sheaf receiver, and thence to the ground. The several operations are effected by contrivances regulated by cams, which are constructed so as to be brought into operation at the right moment. The irregular motion of the cams is somewhat mysterious to the driver at first, because, as a rule, he is little

acquainted with their action previously ; but he soon finds that they cause little trouble, and all that is necessary is to keep them oiled and made fast ; and to renew the twine when the supply runs out.

The Sickle, or Reaping Hook, is not commonly used now, but the increased number of small holdings has had the effect of preventing it from becoming extinct. The edge of the hook is serrated, and the cutting is effected as follows :—The reaper grasps as many straws as he is able to do in his left hand, and at the same time passes the hook behind them ; then, bending the straws *away* from him, he pulls the hook towards his body, and the handful is cut. He previously lays a band on the ground to receive the cut grain, and he places each handful on it until there is sufficient to make a sheaf of about a foot in diameter when tightly bound. If the straws are not bent well away from the reaper, the sickle is liable to slip up the straw and inflict a nasty ragged cut on his fingers. The stubble left behind is generally about a foot in height, and is called haulm. The haulm is cut with a scythe, and as the mower works with a somewhat chopping action, it is called haulm “pecking.” The chopping action is practised so that the haulm may be collected and carried on the left foot of the mower.

The Fagging Hook, bagging hook, or bean hook, as it is variously called, is sometimes used to cut corn. The hooker does not grasp the corn in his hands, but walking partially backwards he presses against the standing crop with his left shoulder and arm, and slashes at the straw with the hook held in his right hand. The cut corn thus

falls against the standing corn, and the hooker collects it as he goes along and places it in a band as when reaping.

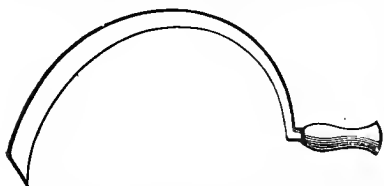


Fig. 9 —Short-handled Fagging Hook.

The stubble after hooking is as a rule not more than three or four inches high. The fagging hook is convenient for cutting out grass and other rubbish in ditches. It is occasi-

onally used for trimming hedges, but a long-handled bill or splasher, as in Fig. 10, is more expeditious.

Where wheat crops are badly laid the fagging hook is very useful. Twisted crops are difficult to deal with, with a reaping machine, as when straws lie in various positions the ears of those lying in the direction in which the machine is travelling are merely stripped off and fall to the ground, and are thus wasted. The stubble behind the machine is rough and unsightly. When the corn lies in one direction only the scythe may be used with great advantage, but where the crop is twisted it is difficult, in the cramped position caused by the surrounding corn, to effect an opening to allow the scythe to work freely. The fagging hook, however, can be used most profitably, as little room is required in which to swing it, and the work is satisfactorily performed. Bean hooking is preferred by many who possess reaping machines, because the parts of expensive machines are much shaken and injured by the jerking sustained in going into the bean crop. Great strain is thrown on the machine when the knife and the row are parallel; while, when the machine is travelling in the direction of the rows, only a few parts of the knife

are engaged, as the rows of beans are generally placed from 16 to 26 inches apart.

The Hedge Splasher takes many forms, as fancy varies in different districts; moreover, the sturdiness of the hedge has to be considered. Very light hooks are suitable for cutting off small twigs of the present year's growth, but if it is desired to cut into the body of the hedge something stronger is required. Very strong slashers are required to cut stout stems for laying or layering hedges. Full description of this is given subsequently when treating with the management of fences.

The Pea Hook is somewhat similar to the preceding kinds of hooks, but is very short in the blade and has little curve. The lower half of an old sickle fixed into a long handle makes an excellent pea-hook. In some districts, especially where few peas are grown, short handles are attached to the hooks, but they are not so efficient as the long handles. The pea crop is difficult to cut because of the trailing nature of the haulm which lies in various directions about

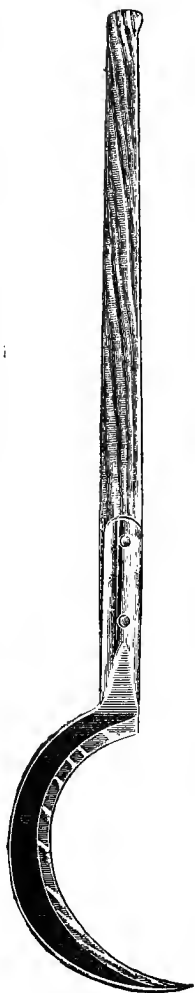


Fig. 10. Hedge Splasher.

the ground, and prevents the use of the scythe, as a large portion of the crop would be left on the ground were it employed. The hooker has to contrive, so that whichever way the crop has fallen he can get behind it sufficiently to cut the haulm close to the ground, and to clear the ground as he goes. He holds the handle very similarly to the way a fork is held, but he keeps it, while cutting, in almost a perpendicular position, and moves it with a sweeping action from right to left, very near to his feet. When he has cut the haulm he pulls and drags it out, rolling it meanwhile into a bundle or wad; and so as to be sure that every straw is cut, he rolls it back a few feet on to the cleared ground, and leaves it neatly rolled up.

Corn Sheaves when not tied by the string binder are usually tied by bands made from the crop to be tied. The bands are made in various ways, but whatever kind of band is employed it is usual to draw out the straws from a tied sheaf, for when a handful of ears are seized the straws draw out straight. The single band is the most simple, and consists of the straws in their natural condition. The tier holds the ear end in his left hand, and clasps the sheaf in both arms; then, kneeling on the sheaf at the place where the band is to encircle it, he pulls the band as tight as possible; the left hand is kept close to the sheaf, by a dexterous turn the straws in the right hand are twisted round those in the left, and the end is shoved between the band and the sheaf. When the weight of the tier is taken off the sheaf it expands and prevents the band from becoming loose. The safest double band is made by taking a good handful of straws

as before ; then to divide them into two parts, one in each hand. The ears of those in the right should be laid across those in the left, and then be twisted round the left. Having done this the fingers of the left hand should be thrust through the straws held in that hand to divide them, and the straws in the right hand should be shoved through the opening. If the straws are stretched out to their full length an effectual join will be made near to the ears, and the sheaf can be tied similarly to the one before described, except that, in this case, as is obvious, both ends of the band are composed of the butt ends, and not the ear ends of the straw. With a little practice the knack of making the hands is soon gained, and the band may be made as the man walks rapidly from sheaf to sheaf.

TURNING LOOSE CORN.

Much that relates to harvesting has been incorporated in the preceding pages, but there are a few processes which demand fuller attention. Although it may appear a simple matter to turn over swathes of corn or hay, there is a decided art in turning them to the best advantage. The rake or fork should be used accordingly as it is found best. The great maxim when turning is to turn thoroughly, not to miss any small pieces. If it is desired to turn the rows lightly it may be best effected by means of the fork. A row turns more lightly when a slight jerk is given at the end of each stroke ; however, it is advisable, as a rule, not to break the swathes more than is necessary, but while lightening the row it is not necessary to break it. Corn lying in the rows requires most careful turning, and this applies especially to barley, which very rapidly loses its

quality if it is not moved in the proper manner during wet weather. If the weather is showery the turning should be done so as to keep the ears uppermost; when turned in this way the water runs away from the ears, but where the straws lie highest all the wet that drops on to them is conducted to the ears,⁴ and the grain is rapidly stained or made to germinate. If the weather is dry it is often necessary to turn up the butt-end of the swathes, so that clover or other green stuff in them may be more quickly killed, thus permitting the corn to be carted sooner.

When corn or grass is put into small heaps, or windrows ready to be pitched on to the cart, care should be taken that every piece is moved, for if the heap is merely placed on one of the swathes the bottom portion will not pick up so easily, and the pitching cannot be done so expeditiously or well; while, probably, the unmoved pieces will not be so dry; these unmoved pieces are the most common cause of mouldy patches in hay-stacks.

SHOCKING OR STOOKING SHEAVES.

Great loss occurs in wet harvests through the bad method of setting up of sheaves in the field before they are fit to be put in the stack. In some southern counties the sheaves are merely set up in a round pile like a bunch of asparagus; this is very wrong, for whatever water falls on them soaks into the ear and straw, to the serious deterioration of the grain. In wet harvests great loss results from this very careless practice, but customs alter slowly, and this one is no exception to the rule. It is usually sufficient if the stooks are made so that the two sides form an acute angle at the top; but when practicable they should be placed on the top of land ridges, so as to

secure the full advantage of the wind, and they should run from north to south, so that as little as possible is sheltered from the sun. Care should be taken to make the sheaves stand firmly on the ground, and the ears should be brought to a sharp angle by an occasional pat with the hands. If circular piles are made they should be capped with another sheaf, made with a band tied closely to the ears, and then spread out so as to form a thatch to shoot off any rain that falls on to it; by this means the bulk of the corn is rendered safer from injury in bad weather. Long stooks may also be capped in a similar manner.

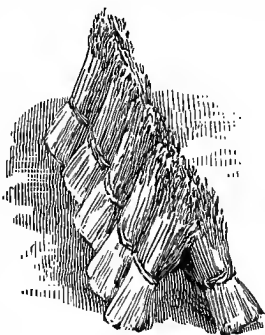


Fig. 11.—Ordinary Stook.

Wind-ricks or Hand-ricks.—Where hand-ricks are built there is not so much necessity to cap the shocks, for in ordinary seasons the wind-ricks afford a good opportunity for drying the moist butts of the sheaves, but it is essential that they should not be too big, otherwise mould may be generated. As a rule circular stacks, with a diameter of about three yards, are most suitable. Stacks of this sort should not be trodden upon, but should be built from the outside, and should be of such size that the builder can control the building without getting on to it. Starting by making a circular stook with the ears uppermost, and laying on the subsequent sheaves with the butts outward to be dried by the wind, the corn is not brought into contact with the earth, and the corn is inside, and away from wet. The building of the roof is the most

important point, as the sheaves must be brought to an apex in such a way that they fit closely, and thus prevent wet running into the stack. This is acquired after a little practice.

The objection to small stacks is that there are many tops, which may suffer to some extent; but it should be borne in mind that they are small in proportion to the quantity stacked safely, and that it is better a little should be injured, than that the whole should be spoilt by being put into too big a heap where mould can set up and spoil all. In very dry years common sense and judgment would dictate if it is safe to make bigger stacks which are more compressed. If, however, there is much green stuff or moisture, it is best not to allow a man to tread on the stacks: much corn is injured in this way every season. After allowing the small stacks to condition, they may be brought together into a large stack, and, if securely thatched, will stand any reasonable length of time, and improve rather than deteriorate. In wet seasons, or in districts where the weather cannot be relied upon, small stacks may be made with advantage.

LOADING CARTS.

In many districts two men or lads are employed on a cart to load it with hay or other loose corn, whereas in others one hand does the work equally well. This is chiefly due to the assistance given by the pitcher, who pitches the hay on to the cart. He places the material methodically, in accordance with instructions from the loader; and does not throw it anywhere about the cart and leave it to the loader to place. When properly pitched, there is need to move very little; but the best

work can only be done when there are two pitchers, so that each pitcher keeps his side level with the one opposite. The order of placing the forkfuls is as shown in diagram, but they may be laid two deep. The pitchers are responsible for the outline of the load, and the loader

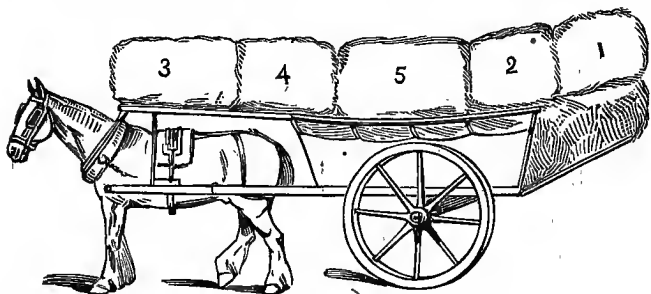


Fig. 12.—Loading Cart.

- | | |
|---------------------------|---------------------|
| 1. Corner behind. | 3. Corner in front. |
| 2. Hip. | 4. Shoulder. |
| 5. Hubber (over the hub). | |

shouts where they are to place it. By placing the pieces in the order figured, each piece tends to bind in the preceding. These are further held in by a course laid up the middle of the load, the loader shouting "The middle," meaning that he requires a piece there. If the pitchers are smart at their work, the loader has little to do but tread the stuff down, so as to make the load firm, and labour is economised. When loading sheaves, one pitcher can keep a loader employed, the chief points to attend to being to keep the sides square, the balance of the cart even, and to lay the sheaves systematically, so that they bind each the others on to the cart. Layers should be built up in this manner until the load is made.

The principles of stack-building will perhaps be more

readily grasped if they are first illustrated by the method of building stacks with sheaves, as important points are more plainly shown by them than by loose bundles.

CLOVER SEED.

Clover seed requires delicate handling because it threshes out readily. Rough treatment, such as is practised in ordinary haymaking or harvesting, would occasion great loss. Before the sun has dried the swath, the clover should be collected into small heaps called "horsehead cocks," because they are made not much larger than a horse's head; if this is deferred much seed is lost. When these are turned, the fork should not be thrust into them, but under them, so that they may be lifted lightly over. The same care must be exercised throughout the harvesting operations. The heaps should be lifted carefully on to the load, and should not be allowed to knock against the sides, or the seed will fall out.

BUILDING STACKS.

Corn properly stacked rarely suffers much from rain which falls upon it, for a well-constructed stack shoots off

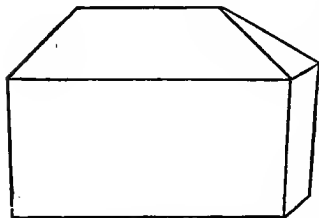


Fig. 13. Hipped Roof.

any water as fast as it falls.

On the other hand, there is great annual loss through ill-constructed stacks. Stacks are usually built on either oblong or round bottoms; those built on oblong bottoms are carried up with almost perpendicular walls, and

carry roofs which have either gable ends or the ends

are made to recede, so that the difficult construction of the gables is avoided. Round stacks always carry conical roofs. It is advantageous to build stacks on frames or stells, as a wholesome current of air is maintained, and this dries and sweetens the corn and keeps the stack free from vermin, such as rats and mice; but it causes additional labour, as the

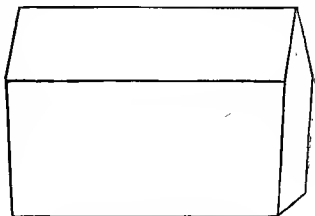


Fig. 14. Gable Roof.

sheaves have to be raised higher. When the building is not placed on a raised frame the corn should be prevented from coming in contact with the ground by means of a layer of faggots, straw, or other material which stops the upward flow of moisture in the soil. Faggots are good for the corn, but they tend to harbour rats. If straw is used, as much should be laid down as will form a layer a foot in thickness when consolidated.

Having prepared a bottom for the stack, a pile of sheaves should be set up in the middle with ears upwards, and sheaves should be placed so that they radiate towards the ends and sides of the stack. If the ears are placed so that they rest on the butts of the preceding sheaf they are kept further away from the ground, and the corn is less likely to be injured by moisture than when they are laid indiscriminately; at the same time the middle of the stack is higher than the outsides, and this is one of the most important points in stack building. The greater weight which naturally presses on the sheaves in the middle of the stack causes them to lie more closely; consequently, if the middle is not kept higher than the

outsides during the process of building, the sheaves sink so that the ears are lower than the butts, and this direction is communicated to the outsides, so that any

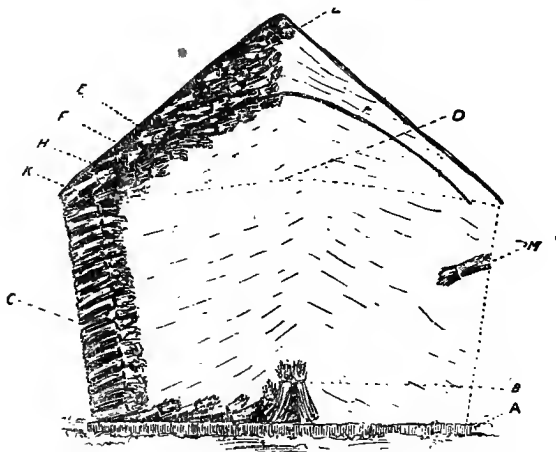


Fig. 15.—Diagrammatic view of section through stack.

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|--|---|
| <i>A.</i> Bottom to keep sheaves from touching ground. | <i>H.</i> Outside layer of sheaves on false roof. |
| <i>B.</i> Stook in centre. | <i>K.</i> Bottom outside sheaf of false roof. |
| <i>C.</i> Sheaves lying with butts lower than ears. | <i>L.</i> Sheaves lying lengthwise on roof to bring it to an apex; sometimes done with straw. |
| <i>D.</i> Line of sheaves when the walls are complete. | <i>M.</i> Sheaf with butt higher than ears, as when the middle of stack is too low. |
| <i>E.</i> Line of false roof. | |
| <i>F.</i> Outside line of real roof. | |

water which falls on the walls is conducted to the centre of the stack, causing great damage. We have seen stacks so badly constructed that the grain, to the depth of two sheaves inside the stack, has been in a rotted condition. If work is to be done efficiently and quickly at least four hands must be employed: one to empty the carts, one to pass the sheaves, one as binder, the other as builder. The builder is responsible for the

outward construction of the stack, and lays the sheaves in courses. The proper method of laying courses is for the builder to walk backwards, so as to level down the previous work and consolidate it; he should commence to lay the sheaves midway along one of the sides, and the sheaves should be laid in the order shown in the diagram. The process of building up is worked in small blocks, nine or sixteen sheaves, according to their thickness, going to form a block, the number being regulated by the distance the builder can reach. Each block is built up to the completed work. The builder draws back the distance at which he can work and fills in the intervening space, beginning to lay the sheaves *not* next to the completed work, but piling a layer against his legs; if the sheaves are big, the width of three is sufficient; if small, he takes four, and thus fills in the space with either nine or sixteen sheaves. He uses both his hands and legs to press the sheaves, and generally kneels on each block before leaving; in this way, although the building-up is done perpendicularly, the layer is left not quite perpendicular, and each sheaf helps to bind the others, and each block binds in the previous block. Having worked right round the stack, he works in the opposite direction, alternating the direction each course. This method of building is much better than one practised in some districts, where the builder travels on his knees in the direction in which he wishes to build. The compact laying of the sheaves is not nearly so well attained as

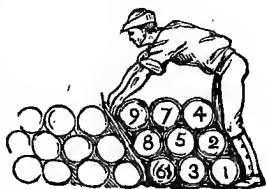


Fig. 16.—Order of Laying Sheaves to ensure Firmness and Safe Binding.

when the system described is adopted. He has to be particular to put in more work at the corners than at the sides, as owing to two sides of the corner receiving no pressure, whereas the rest of the walls receive pressure, the corners would slip out. Corners are the great trouble to the builder. Consequently in some districts the ends of the stacks are made circular, with advantage, although they do not look quite so smart. The builder's work, however well done, is dependent for ultimate success on the work of the "binder," who follows behind and builds the inside of the stack; the binder lays his sheaves so that the butt ends lie up to the bands of the outside layer.

The sheaves, from the time when they are lifted from the cart, should never be allowed to touch the stack until they reach the place where they are to lie, otherwise the work cannot be done so expeditiously. Pitch-holes are places left at various heights in the walls or roof for the workmen to stand in, and should be avoided as much as possible, as when filled in they do not sink evenly with the rest of the stack, and form weaknesses in the roof, which, if great care is not taken, allow the wet to enter. In some districts pitch-holes are built in the walls, which is a lazy performance, and decidedly wrong.

The walls of the stack should not be carried up perpendicularly, but should lean outwards to free themselves from the wet that falls on them. When the walls are as high as is considered necessary, a false roof should be built, as shown in Fig. 15. If this is done the real roof may be so built that it is practically impossible for wet to drain in. The false roof should be commenced about half a yard from the walls, and be drawn in more

quickly than the permanent roof; then the outer layer of sheaves may be placed as is shown in the diagram, with the butts of the sheaves protecting the ears of the sheaves below. The roof should be brought to an acute point at the top or ridge.

When building a stack with loose or untied material, such as grass, the same rules must be observed; the two most important being to keep the middle well filled, and the corners higher than the rest of the walls. If the stack is so situated that it is only practicable to empty the carts on one side, the building should be kept higher on the opposite side, because it is subjected to less treading; consequently, when in course of time it sinks, as it must, the stack is bound to slip in that direction, and if the straw is very slippery the stack will fall over. Loose corn should be covered in as quickly as possible, as it cannot shoot the water off itself as freely as it runs off sheaves.

TRIMMING STACKS.

The paring of stacks to make the outsides neat and better able to resist the entry of water, and to keep out vermin, such as rats and mice, may be left until after thatching, provided they are pared sufficiently to allow the thatcher to do his work properly. This is often a convenience in harvest when more important work has to be done. The work is done by means of the paring knife, which is used to make the sides smooth. A well-built stack requires little paring. Haystacks are more often pulled than pared, and the pulling is roughly done during the process of building, so that there is less loose outside to be spoiled by over drying or rain. The work

is more neatly completed at a convenient time. The loose outside straws of stacks of untied barley are often tucked in. It is effected most neatly when the tucking is done in horizontal rows. It is better adapted for stacks that are to be threshed within a short time than for those which are to stand over winter, as birds are able to pick out more corn than when they are pared.

THATCHING.

Corn and hay stacks are often covered in with other materials than straw thatch; corrugated iron, Willesden paper, Dutch barns, and other coverings being used in places; still by far the greater portion of the covering is effected by straw thatch. Before commencing to thatch, the roof should be prepared to receive it by tucking in or paring off those pieces which stick up too high, and by stuffing in straw where there are depressions. If the ends of the stack are carried up in the form of gables the ends should be pared with a paring knife, so that there is a solid bed right to the outside on which to lay the thatch. The walls just below the eaves should also be pared so that a definite line of eave may be made. If from any cause the walls have been carried up in a manner which allows the wet to run down them instead of being shot off quickly, it is necessary to remedy the defect by packing the walls close up to the eaves with tightly bound bundles of straw or "bastards," so as to make a firm and continuous roof as low down as is required to render the walls, when thatched, safe from wet. The straw for thatching should be prepared for drawing at least a day before it is used. It is best prepared when thrown into a heap, water being

thrown upon it occasionally, so that it becomes well saturated throughout. It should lie for at least a day, so that it may toughen. Straw is drawn in the following manner: the drawer quickly gathers the ends of the straws which protude from the heap, draws them out and lays them at his feet, combing out the loose flag with his fingers; when a layer about four inches in depth, and about eighteen inches in breadth, called a yelm, is drawn. The drawer grips it in the middle with both hands, places it somewhat askew on a rope fitted with a running noose at one end; he continues making yelms until sufficient to form a bundle as heavy as he can conveniently carry up the stack is made; but he lays each yelm rather across the one below, so that the thatcher may be able to separate them easily. Thatching is most expeditiously done when two men are engaged, the thatcher to prepare the roof and lay on the thatch; the server to prepare the straw, spits, cord, water, etc., and generally to wait upon the thatcher. Having prepared the roof, the thatcher ascends the ladder, taking with him a jack or rest on which the bundle of straw is placed; this is hooked on to the roof.

On a gable roof the first layer of straw, called a "stelch," is laid, not directly vertically, but tending somewhat laterally towards the end; the straw is laid two yelms deep so as to give a smart finish, and also to better clear the ends of wet. This layer is bound down by means of tarred cord fixed on to the stack by means of spars or spits about 2 ft. 6 in. in length, the line or cord

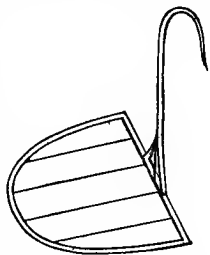


Fig. 17.—Thatching Jack.

being run about 10 in. from the outside. This layer being laid, another vertical layer is commenced, and is so placed that it reaches quite up to the spits. All the stelches are commenced at the bottom, in the same manner as tiles are placed on roofs. Two yelms are placed at the bottom so as to form a more thorough eave, and the stelch should be commenced low down for the same purpose.

Each stelch is made by placing three yelms side by side, and the ladder is placed at the required distance from the previous stelch to permit this. The workman generally works on his right side; he takes the thin end of each yelm in his right hand and raises a small piece of the roof with his left so as to make a small place into which he tucks the end of the yelms to make it more secure. The chief art in thatching is to secure the straw in the roof; to join each stelch to the previous one so that water cannot drain between them, which is effected by tucking each succeeding one slightly under the previous one; and to comb out the straw straight so that the water is rapidly conducted off the roof. Having laid a stelch from bottom to top of the roof, the thatcher beats it with the back of a rake, made



Fig. 18.—Thatching Rake.

like a comb with a handle carried out in a line with the head; he alternately beats to consolidate the thatch, and rakes to comb the straw straight, occasionally sprinkling with water so that the straw may be more compact. Good thatching cannot be done with dry straw, and this accounts for much of the bad work

done in some districts where straw, or reed, as it is called, is drawn some time previously to thatching. It is necessary, with this dry-drawn reed, to pin it on to the stack with innumerable spars, which are made of hazel or willow, and are bent over so as to pin it after the manner of a lady's hairpin. The work is tedious, often not efficient; and the straw is dangerous if subsequently used as litter, as the "hedgehog," as the old thatch is called, because of the many sharp points which stick out of it, is liable to injure animals treading or lying upon it. It is a maxim among many good

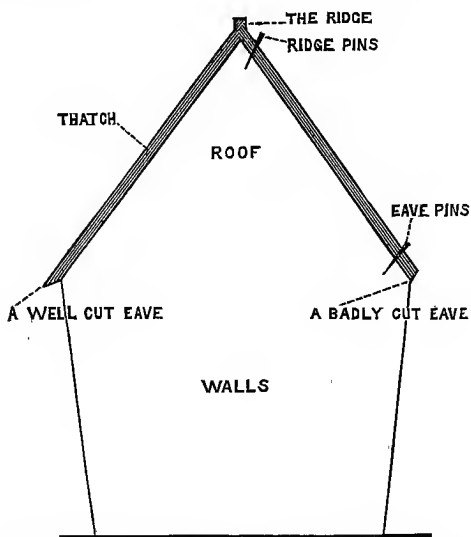


Fig. 19.—Cross Section of Stack showing position of Thatch.

thatchers that the server's shirt should always be wet through; but this may be avoided if a tarpaulin cloth is worn over the back.

Having finished a stelch, the thatcher proceeds to tie it on, and tar-cord is the smartest and best material for the purpose. The strands may be as numerous as desired, but most good thatchers can make their work secure with one at the eave and one at the ridge, unless the position of the stack is very exposed. The pegs or spits are usually placed about 16 in. apart, and the string is slipped over the spits, a running noose being adopted for the purpose. The best thatchers cut the eaves as they proceed with the thatching. By far the greater number of eaves are cut badly; consequently, instead of the water being shot clear of the walls it runs down them and causes damage. As the thatcher finishes the binding on of each stelch he should cut off the eave with a paring knife at about the height he wishes to leave the eave, and

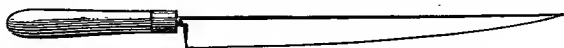


Fig. 20.—Paring Knife. (Blade 2 ft. 6 in. long.)

the eave should be cut parallel with the ridge; the neatness and smartness of the work depend a great deal on the accuracy with which the eave and ridge are cut, as they are the first points which catch the eye. Having cut the eave with the paring knife it should be made smart by trimming it with a pair of ordinary shears. It is very important to cut the eave so that the water cannot run down the walls, and to ensure a good shoot the eaves should be cut so as to form an acute angle well away from the stacks; to effect this the shears must be made to point upwards while cutting. Whilst the eaves are being cut the spits should be constantly hammered so that the eave is made compact, and slightly turned up, otherwise when

the straw decays the definite edge of the eave may be lost, and the walls will suffer.

Round stacks are more easy to thatch than are those with gable ends, but as the roof is conical the stelches must be broader at the base of the roof than at the top. Hipped roofs are often troublesome to young thatchers, as it is difficult to join the stelches; the various yelms must be well worked in and made to cover all joins; to make the work safe extra strands of cord should be pinned over the hips. Good thatching, capable of keeping out the wet for two years, can be done for a shilling a square of 100 feet; a good thatcher can make a roof secure with half the straws required by a moderately good thatcher.

REED THATCHING.

The common waterside reed makes a very neat, comfortable, and durable thatch for roofing houses and farm buildings; it is perhaps owing to the scarcity of men able to work it that it is not more commonly used, especially where reed is plentiful, and other roofing materials are difficult to obtain. The reeds should be cut when mature, and tied into sheaves or bundles, and allowed to dry before being stacked.

The roofs of buildings require only rafters, as a small quantity of stout reed called fleaking is spread over them, and takes the place of lath; but a narrow eave board is nailed along the bottom of the rafters to make the eaves rigid. The thatch is laid on the fleaking, and is bound to the roof by wooden rods called sways, which are fastened to the rafters by stout cord, or iron hooks such as are generally used when thatching with straw. A peculiarity in thatching with reed is that the reed is not

laid on in longitudinal courses. The workman begins to lay the reed in the right hand lower corner, and works upwards irregularly diagonally until he reaches the upper left-hand corner; the remaining part is finished in gores.

The eaves are set by laying on a coat of reed, 8 in. to 10 in. in thickness, with the butts resting on the eaves-board, and the heads upon the fleaking; the reed is fastened by means of a sway, which is placed about 8 in. from the butt. To make the reed compact and secure, an assistant, who is working on the inside, runs a needle, threaded with stout cord, upwards close to the rafters, and, in this case, to the eaves-board; the thatcher seizes the needle and passes it over the sway and returns it through the reed to the assistant, who draws it back, unthreads it, and then ties the two strands of cord securely round the first rafter. During the tying, the thatcher presses and beats the reed, so that it may be more tightly secured. The needle is passed through by the next rafter until the whole length of the sway, some 8 or 10 ft., is secured. This operation is more expeditiously performed when iron pins are employed, but perhaps the thatch is not so densely packed.

Another layer of the same thickness is laid over the first layer, and is secured in a similar manner, except that the sway is placed about 12 in. above the first. The eaves are then neatly finished. The eaves are not cut, as in ordinary thatching, but are beaten into shape by a bat or egget, which is made of a board about 8 in. square, fastened to a handle 2 ft. long placed obliquely on it. The eave should show a flat base horizontal with the ground.

To obtain the desired diagonal line, the next few sways,

placed about twenty inches above the last sway, are successively shortened until they run out to nothing, in which way a triangular corner of thatching is formed. After this the sways are used at full length. The diagonal prevents gaps or seams being formed. The face of the roof is formed and adjusted with the legget, which, whilst making a smooth and neat face, tightens the tapering reed as it drives it up.

The stoutest and longest reed should be employed at the lower part of the roof, as the shortest is useful near the top, because, as the layers are fastened down near to the butt of the reed, a considerable portion of the upper part near the roof would be of less thickness if all the reeds were of one length. Even when shorter reed is used there is a portion which runs to a point thinner than the lower part; as a means of meeting this, and to secure the upper ends of the reeds a cap is affixed. The cap is made of straw, rye straw being the best, as it is toughest and most durable. The cap or ridge is made in two layers: first horizontal, and the second vertical. The horizontal layer is laid on the reed so that an angle is formed at the top, and it is secured by means of spars 2 ft in length, formed of rods about as thick as a finger, doubled over to form a forked pin. The final layer is sometimes laid over the ridge and fastened down on both sides; but a smarter way is to thatch it in the ordinary manner so that an acute angle is formed at the ridge. The mode of fastening is to lay rods of about $\frac{3}{4}$ in. in thickness and 4 ft. in length horizontally over the thatch, about 8 in. apart, and pin them down with doubled spars placed every 4 in. apart. The eave of this small cap is cut where the uppermost butts of reed appear, a pair of shears being employed to

make the eave sharp; the thickness of the cap at the eave being about five or six inches. When measuring thatching, which is done by the piece, the underside of the eave is usually measured in with the height.

THRESHING CORN.

Time is often wasted because preparations for threshing are not made until it is expected that the threshing will commence. Sacks are not forthcoming, coals have been forgotten, tubs to hold water are not in readiness, and various other little matters which have an important bearing on the work are neglected, and cause a hindrance to a whole gang of men, which a little forethought might have avoided. A sheet should be placed between the stack and the machine to catch any grain that would otherwise fall to the ground and be lost. Machines are made so perfectly now that there is seldom a necessity to place a sheet under the machine itself, although a few years ago there would have been great loss had this been neglected.

The man who feeds the machine should force the corn into it in a steady stream, and not jerkily by uneven feeding. He should break the sheaves or bundles, so that the full effect of the beaters is brought to bear on all parts of the straw. The person cutting bands should stand in such a position that the sheaves fall easily into the feeder's arms without his having to reach after them, as the feeder's whole energies should be directed to forcing the grain into the mouth of the machine. The man who throws the sheaves on to the platform should place them conveniently for the band-cutter, and the sheaves should all lie with their ears in one direction.

The concave should be set so that while all the grain is knocked out of the straw none of it is broken by the concave being too closely to the drum; and care is required when threshing barley that the ends of the grain are not chopped off too closely, for when this is done the grain is not only useless for malting purposes, but, as it becomes covered with mould, it does injury. It is necessary to see that none of the sieves become blocked, as if this occurs the work is not efficiently done. The machine should be thoroughly swept down and cleaned out before a different kind of corn is threshed. It is found very difficult to keep valuable stocks of seed corn pure, as sufficient care is not taken to clear out the machines; weeds, too, are transported by travelling machines. Water should not be allowed to enter the machines, as it causes parts to swell, so that it is difficult to alter them when required; and accumulations of dust are converted into lumps of mud, which often become seed-beds for the grain to grow on, and tend to cause rapid decay of the machines. The machines should, therefore, be kept covered up except when actually at work.

The bearings should be kept clean, otherwise there is a chance of the oil-holes becoming blocked. Special care should be taken that new bearings do not become too hot, as is probable on account of the roughness not having been worn off. Straps or belts should be kept in good repair, as neglect in this respect is the cause of frequent and long hindrances.

When threshing sheaved wheat, two hands are required on the stack to supply sheaves to the machine: one hand on the platform to cut bands, and one to feed. When the

elevator is used, two hands are required to stack the straw; when not used an additional two or three hands must be found, according to the height of the stack, to carry up the straw: one to look after the chaff and cavings, one to attend to the corn sacks, one to drive the engine, and a lad to carry water. Additional hands are required on large stacks of loose corn to keep the machine well supplied. When threshing hard peas it is often necessary to put up an awning to prevent the peas being knocked away and lost. The most simple method is to fix up a tent made of hurdles covered with sheeting or tarpaulin. Care is required in setting the machine that the peas are not split; and, in some instances, it is found advisable to take out each alternate beater, or to take off the steel bars, so that the blows are not so severe.

Clover seed is threshed by the ordinary machine; but the work is not completed until the "cob" is run through a special machine called the clover rubber. The cob is that portion which leaves the machine where the chaff from corn comes out, and is composed of the seed and broken flower-heads. If it is not convenient to rub the cob at once, it should be stowed in a dry barn, but no unnecessary delay should take place before rubbing it. The rubbing is less satisfactorily and more expensively effected in dull or wet weather, therefore it is injudicious to commence threshing except when it is dry. The cob should be emptied into the barn as lightly as possible, and on no account should it be trodden upon.

Working the Threshing Machine.—In Fig. 21 is shown a longitudinal section of an ordinary threshing-machine, so illustrated that the course of the

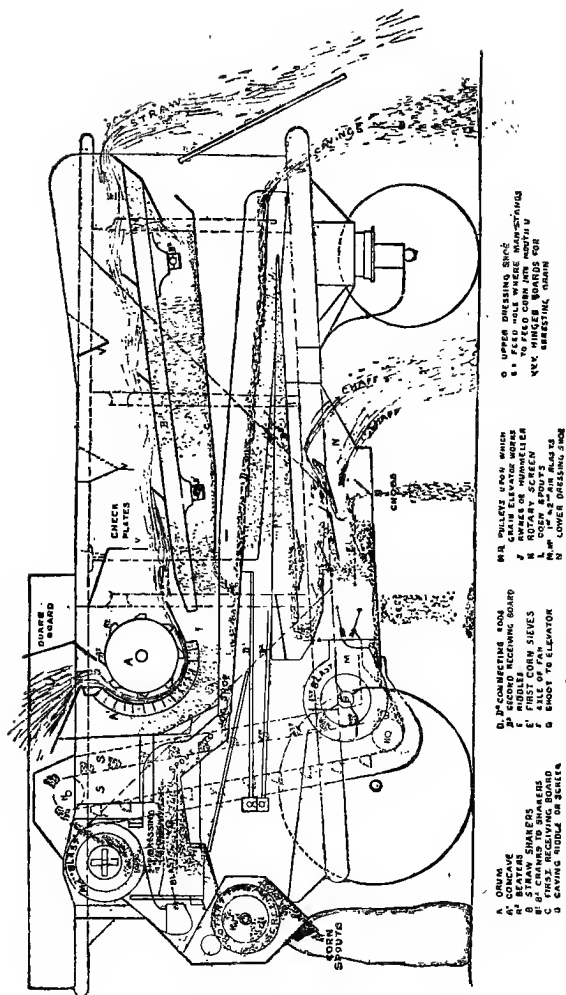


Fig. 21.—Longitudinal Section of Threshing Machine.

material being threshed may be readily traced. The engine-driver is usually responsible for the setting of the threshing-machine, which must be placed at such a distance from the engine that the driving-belt will fit tightly over the fly-wheel of the engine and the drum-pulley attached to the drum shaft (A), Fig. 21. It is necessary that the fly-wheel is directly behind the drum-pulley, which is ascertained by standing behind the fly-wheel: when the outer rim of the entire wheel appears to run just within the flange of the drum-pulley, the proper line is found. Water bulbs are attached to the thresher to indicate when it is level, and the wheels must be lowered into the ground to ensure levelness, otherwise the corn will not pass evenly over the sieves. The machine must then be firmly secured in its place by means of blocks placed tightly against the wheels; after which the sheaf platform should be opened ready for the corn to be laid on it.

Machines made by the several makers vary in some slight details, but the one illustrated is a good representation of those most commonly used; and if the course of the corn through this machine is understood, the labourer will tell at once what the differences are when he has to work one of different make, and will readily adapt himself to the modifications. On the platform are two openings, in one of which the feeder has to stand, and the other leading to the beaters. Over the beaters is placed a guard-board to prevent accidents to those engaged in the dangerous work of feeding, and although there is a great disposition on the part of workmen to render this ineffective, on account of the slight inconvenience it causes, the practice is one which should be strictly discounten-

anced. When sheaved corn is to be threshed a hand must be supplied to cut the bands and place the sheaves in the arms of the feeder, whose whole care should be directed to passing the material into the machine. When loose corn is being handled the assistant should shake up the wads so that they do not pass into the machine in a solid lump. The feeder further breaks up the mass and forces it on to the beaters, which seize it and speedily draw it between them and the concave.

When the threshing has commenced, the engine-driver should inspect the work done so as to rectify errors. In the first place, he should see that the grain is thoroughly freed from the straw, when he will know that the beaters are placed close enough to the concave. Then he should go to the corn spouts to see that the grain is not broken, for if it is the beaters are too near to the concave, and must be set wider apart. As the work proceeds he should from time to time make these inspections, as the condition of the material in the body of the stack frequently differs from that in the roof. To make the necessary alterations he has to change the position of the concave, which is adjustable, whereas the drum carrying the beaters is fixed. Adjustable screws are found on either side of the drum to make the alterations. The concave will be found to be in two or more plates, as the arc of the drum and the arc of the concave are parts of circles of different diameters; this is necessarily so, as they must be wider apart at the top where the grain is placed between them loosely, than where the actual threshing takes place. Having seen this is right, it is necessary to see that the sieves work freely, and that the parts are kept freely oiled.

When the sheaf is drawn between the drum and the concave the grain is threshed out, and the threshing is complete. The succeeding operations are for the purpose of separating the straw, chaff, and grain, and rendering the grain free from impurities, such as dirt and weeds. The straw is caught off the beaters by the straw-shakers, which are long racks worked on cranks, which give them a forward and upward motion, and finally deposit the straw at the back of the machine. When this is effected, the straw is not handled again. During the shaking, the grain, dirt, chaff, and pieces of short straw fall through on to the first receiving board, and are shaken back to the interior of the machine, where they fall on to the caving-screen. Here the grain, &c., falls through perforations on to a second receiving board, and the cavings are deposited near to where the straw was cast. The receiving board again takes the grain, &c., back to the interior of the machine, and they fall on to the first corn sieves, meeting here a strong current from the first blast, which separates the chaff from the grain. The chaff is blown out of the machine; the small seeds fall through the bottom riddle and are conducted to the outside, while the coarse dirt, sticks, and other portions called chobs, which cannot pass through the grain sieves, are also conveyed to the outside. This constitutes the first cleaning, and, with the exception of a limited quantity of impurities, nothing remains but grain, which has to undergo a closer process of cleaning.

When the grain leaves the first riddles, it is conducted to the corn-elevator, an endless belt, carrying cups which scoop up the grain and convey it to the top of the machine, where it is delivered into the awner or hum-

meller, where particles of chaff or awns adhering to it are broken off. From the awner the grain passes on to a fresh series of riddles, where it meets the second blast. The second blast is usually directed so that it bears upon the grain at two points; first to separate the impurities immediately after awning; and, secondly, to winnow the grain when passing through the sieves. The chaff thus blown out is blown on to the caving screen, and joins the cavings on their way out of the machine.

From the second series of sieves the grain passes to the rotary screen, through which it is conveyed by helically placed bars, the small seeds and thin grain fall through the bars of the screen, and by means of conducting boards they are divided so as to fall out of separate spouts. The stout grain will not pass between the bars, and is conveyed to the end of the screen, where it falls into funnels which connect with the corn-spouts, from which it passes out of the machine.

The operations performed are effected in the following order in all machines: (1) The corn is threshed from the straw, and the straw at once got rid of; (2) The cavings are separated and passed out of the machine; (3) The chaff and small seeds are blown out, leaving nothing but roughly cleaned grain; (4) The second cleaning, after the grain has been taken up the elevator, is effected by the awner, second blast, second set of riddles, and the rotary screen.

Turnip Seed.—Turnip seed does not thresh out readily if there is the slightest dew upon it. On the other hand, when it is dry enough to thresh it falls out very readily, consequently, the greatest care has to be exercised when

moving it during all the operations before it is brought to the threshing cloth. In some districts the crop is brought to the cloth on small sheets; but it is more expeditious if properly constructed seed carts are employed. These carts should be lightly constructed, the bodies long, and the sides high; the sides should be made to let down in the same manner as the sides of a railway-wagon, and the whole be mounted on low wheels. Carts of this shape are required, because any seed which hangs over the side is extremely liable to be threshed out and lost during the operation of loading.

The sheaves are not often tied, though if the crop is to be stacked it is an advantage, as then the butts of the sheaves can be placed towards the outside of the stack; if the seed is placed outside the birds eat it. The seed requires turning occasionally before it is fit to cart and thresh, the two operations generally being done simultaneously, the seed being carted to a large cloth laid out and firmly secured on the ground. As the seed is brought to the cloth it is thrown on to it in long lines, and an ordinary field-roller is run over it several times, the material being lifted and turned on each occasion. If the seed is blown over by wind, a large quantity falls out, so it is obvious that care must be exercised in handling it when it is ripe and dry. When loading it, the pitcher should use a pitchfork with very long tines, and should insert the fork at the lower end of the sheaf; this should be done carefully and gently, then with one motion the sheaf should be lifted on to the cart. The cart should be constructed so that the seed which is knocked out during the loading is not lost. Large growers provide themselves with specially constructed

carts, but failing these, the carts should be made secure by means of sheeting nailed on them. The material should not be loaded wider than the cart, or the seed will fall outside on to the ground.

The Flail.—The flail is not commonly used now, but it is convenient for threshing out small quantities of choice seed corn when it is desirable to keep it pure and

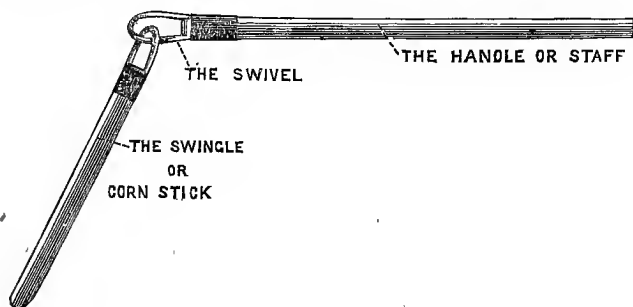


Fig. 22.—The Flail.

free from weeds. Threshing machines are rarely sufficiently well cleaned out, so samples become mixed and the purity of the stock is destroyed. On other occasions it is found convenient to use the flail. Peas, beans, and other similarly constructed seeds are often split and rendered useless for seeding purposes when threshed by the machine. A tasker or thresher is supposed to be able to make his own flail. It is divided into the handle, which is longer than the swingle, or part which beats the corn; it is also thinner. The two parts are connected by a swivel on the end of the handle, through which a piece of leather, tightly secured to the swingle, passes and forms a hinge.

An ash rod about $1\frac{1}{4}$ ins. in thickness is chosen for the handle, and near the end, about $1\frac{1}{2}$ ins. are cut down so as to be not more than about $\frac{3}{4}$ an inch thick; but a small piece about $\frac{3}{4}$ in. long at the tip is left so as to form a button or knob. This is left so that the swivel may be firmly secured to it. The swivel is



Fig. 23.—End of Handle.

ingeniously constructed from a piece of well-seasoned ash. About 9 or 10 inches of an ash rod are taken, and this is split in halves longitudinally; one-half is taken, and about half the substance is cut out of all but about $1\frac{1}{2}$ ins. at either end. The piece is then immersed in boiling water until the wood is pliable, and can be bent without cracking. After this the pieces at the ends are dished out so that



Fig. 24.—Section of Ash cut ready to form a Swivel.

when the section is bent so as to form a swivel the two completely embrace the thin portion of the handle, and the swivel is complete. A stout green leather thong is then passed through the swivel and secured to the swingle, but room must be given to allow a reasonable amount of play. The swingle should be made of a piece of stout, well-dried blackthorn about two-thirds the length of the handle. In using the flail, instinct prompts the beginner to swing it wrongly. The greatest effect is produced when the swingle, while rotating round the head of the handle, is made to pass upwards and over from the inside to the outside. Thus, when the right hand is highest up the handle, the stroke should be made so that the swingle swings up from below the handle and passes by the face, and is then turned over the handle so that it is brought down on the corn slightly to the right of the tasker. The contrary

direction should be practised when the left hand is highest—the stroke finishing on the left side of the body. Some practice is required before the beginner develops skill. The corn should be laid out in long rows across the barn, and be occasionally turned until all the corn is threshed out. The straw must be taken off by a fork, and the shorter straws or cavings require raking off. After which the corn must be put through the winnowing machine to render it fit for market.

Winnowing.—Threshing machines have been brought to a high degree of perfection, and for many years the improvements have been chiefly directed to the parts which clean and separate the corn. A well-constructed threshing machine will turn out a sample of corn in as clean a condition as was usually attempted before such machines were contemplated; but it is found in practice that additional labour expended in rendering a sample as perfect as possible is well repaid. Another advantage of working the corn after it has left the threshing machine is that variations in quality or condition in different parts of the stack become thoroughly mixed so that the bulk is similar throughout.

Machines used for cleaning corn are either winnowers, which, by producing a strong current of air, separate grain of varying density, or sifting machines, or screens, which by openings or perforations allow the small grains to fall through while the large ones remain above, as in the case of the ordinary hand-sieves; or the machines may be combined winnowers and sifters. Although other machines have been designed, there is nothing which supersedes that which won the R.A.S.E. medal at their first great trial. It is the only

machine which makes a thorough separation by wind. Other machines will blow out chaff, dust, and the lightest grains, and will sift out dirt or broken grains ; but they cannot be equally well relied upon to get rid of "grown" kernels or wild oats. Grown kernels are those which, owing to wet weather during harvest, have sprouted, and then died. These frequently lose but little in density, and do not alter in size ; thus they cannot be separated by sifting, and a strong blast is required to separate them from the sound grains. Wire screens are objectionable, because the dried sprout curls round, and often becomes caught in the wires, and finally falls back into what should be the cleaned and perfect grain. Grown kernels are the worst blemish in a sample of wheat, because the flour from them will not rise when yeast is applied to it, and bread made from it is heavy ; and barley malted in the field cannot malt again ; consequently, when it is worked in the malting-house, the grown kernels become covered with mould, and seriously damage a large quantity of good malt.

The great principle, when working a winnowing and dressing machine, is to work quickly, so that the corn passes rapidly over sieves, and foreign matter is shaken off ; whereas, if the corn is passed slowly on to the sieves it remains on them for a lengthened period, and the impurities ultimately shake through with it, consequently perfect cleaning is not affected. There should always be a slight stream of corn passing off the sieves temporally going to waste, as it were, then the impurities are almost certain to be carried off. A receptacle should be placed where the offal leaves the machine, and when this is full, the man who is feeding the machine should empty it

into a hand-sieve, and sift back the good on to the heap from which he is feeding the machine, so that it may be well mixed previously to being passed down the machine again; that which remains in the sieve is offal. It is better to err by wasting a few grains of sound corn than by sifting it down so much that the impurities are returned to the heap. If the offal is not worked through the hand-sieve until after a large portion of the bulk is dressed, it will prove difficult to work it up so as to make it of similar quality and value to the main portion of the cleaned corn; consequently it will be a source of loss. In some districts the hand-sieve is rarely used, and the winnowing is done in a careless and inefficient manner.

Ordinary winnowing or dressing machines require three hands to work them: one to feed the machine, by placing the corn in the hopper, one to turn the handle (and it is very important that he works regularly and not spasmodically, or the work done will be irregular, and the bulk will not be like the sample), and one to clear away the corn as it is cleaned. Where the space is limited, or when the corn is to be taken to a distance, it should be put into sacks by the man who is clearing it away. When working with the machine referred to a smart man can fill and measure twenty sacks per hour, if he works skilfully; but some machines are made so low and so awkwardly that the most skilful man could not do so. The delivery board, where the corn comes out of the machine, should be raised so that the hand-sieve may be placed a considerable distance under it to allow the corn to fall directly into it. This corn should be run into the bushel, care being taken that the bushel is not struck, and, when filled, the strike (a straight rod or board) should be passed

quickly over it to shove off any superfluous kernels. To fill sacks quickly from a bushel, the bushel should be placed on the ground between the workman's legs, care being taken that one handle is between his legs; the sack should be drawn over the top of the bushel so as to form a hood, and should be drawn over so far that the handle of the bushel may be grasped by the right hand while holding the mouth. When both are securely held, all that is necessary is to turn the bushel up and the corn will fall into the sack; a slight lift of the sack will send it to the bottom. The same practice should be followed with the succeeding bushels until the sack is full. There is no need to provide a boy to hold the sack, as is often done where the filling is carried out in an unworkmanlike manner. When putting up for market it is customary to allow 11b. per bushel for the weight of the sack for grain, and 5lbs. for a 4-bushel sack of clover. Wheat sold at 18 stone net is thus weighed at 2cwt. 2qrs. 4lbs.

Various forms of machines are made for screening corn, but, as the action is so simple, it is unnecessary to describe the methods of working them, but it must always be borne in mind that if the corn being dressed upon them does not pass off them sufficiently fast there is danger of impurities working through in the wrong direction.

BARN MANAGEMENT.

Barns should be kept scrupulously clean, as corn lying untidily and carelessly about is "matter out of place," and the barn not only looks dirty, but the various articles in it are liable to become mixed, and thus deteriorated. If barns are not kept dry and clean, insects develop in them,

and cause injury to the corn stored therein. Weevils are a common source of injury, especially in old buildings, and they are very difficult to totally destroy. Should they invade a building, all corn should be cleared out of it, and the whole place should be thoroughly swept out, so that they are starved; and the walls should be lime-washed. Where meal is stored, the meal-maggot is liable to do injury, and care should be taken to leave no accumulations of foul meal or dust for them to harbour in.

When the flail was used for threshing corn, the taskers were not allowed to wear heavy nailed shoes, because, when trodden on, the kernels were crushed and injured. Although there is not the same liability to injury now that the corn is less handled in the barn, it is advisable not to tread on the grains more than possible, and a sack or a piece of cloth should be laid down where the workmen tread most, especially when they are working among corn which is to be used for seed purposes or for malting.

Sacks should be kept in good repair, and work may often be found on wet days in mending sacks. Mice are particularly destructive to sacks, so should be kept down by poisoning or trapping, but these are unnecessary if owls and cats are encouraged to enter the barn.

A scraper and brush should be placed near to the door so that the men may clean their boots before entering the barn.

The weighing-machine should be kept in good repair, and well oiled. Where machines are constructed in such a way that they may be thrown out of gear, advantage should be taken of this to prevent the more delicate parts from being injured when a load is placed upon them, otherwise the machines will lose their accuracy.

Sieves should be placed in a box provided for that purpose, and never be thrown on to the ground, or, owing to their frail construction, they will probably be injured.

CHAFF CUTTING.

The improved construction of the chaff-cutting machines turned out by the principal makers, has rendered the feeding much easier and safer than was the case a few years since. Many serious accidents causing loss of life and limb have occurred through neglect to see that the provisions to guard against accidents are not out of order. The knives should be set so that they touch lightly against the steel face of the mouth of the feed box, as the edges of the knives are thus prevented from turning back. In sharpening the knives, the files should be laid flat on them, so as to produce a long bevel, or the sharpness is soon lost. Blunt knives cause hard work, and a large quantity of cavings are formed, as the straws are not cut off cleanly, but pull out.

CHAPTER VII.

PLOUGHING.

A SKILFUL ploughman is always a valuable servant, not only because of the good work he does with the plough, but because it is found that if he excels in this respect he is capable of performing many other kinds of work. A good ploughman has a straight eye; a firm arm and steady wrist; a quick perception of the nature of the land; the knowledge which guides him as to the depth and width that the furrow should be made for the particular crop which is to be grown; a thorough knowledge of the implement, and tact to rectify by slight alterations any defects which it may possess; and he must be skilful in the handling and management of horses. A man who possesses these attributes can readily turn his hand to other work, consequently a good ploughman is generally entrusted with much of the most skilful work on the farm.

Until within the last few years ploughing has consisted of inverting the land in a solid furrow; the soil was turned over in a continuous furrow with as little alteration of the relative position of the particles of soil as was possible; if anything, the particles were consolidated rather than loosened. A large proportion of the ploughing is still done in this manner; but the introduction of "digging" ploughs, which, while they invert the soil tend to loosen it, has caused different ideas to prevail as to the

valuable points to be considered, and it is probable that the old method of consolidation will die out except on the very lightest soils, and where firm seed-beds are required for special crops. It may also be a long time before the digging ploughs are employed to plough up heavy land in autumn, but the practice is spreading among those who own such ploughs, as it is found that, owing to the different conditions in which the furrows lie, it is not so prejudicial for the tops of the furrows to be somewhat flat. When the furrow is compressed it is necessary that a large portion of it should be brought into direct contact with the air, otherwise the solid core which is made by compression is not rendered friable. When there is no solid core to make friable, it is not so important that it should be made with a high or crested ridge; hence, many who before they used the digging ploughs, most strongly urged the necessity of a sharp-edged furrow for autumn ploughing, have moderated their views, and the more general use of this economical form of plough may be safely predicted.

The ploughman must understand the different kinds of furrows he has to turn when preparing for various crops. On the lightest soils there is less skill required than on the heavy, sticky land, which when wet is difficult to walk upon. Land which clings to the shoe in wet weather is liable to become consolidated when it dries, and calls for the greatest skill in management. Otherwise, a well-prepared seed-bed will not be obtained at the proper season.

As a rule, a smaller furrow is required on heavy land than on light land, not only because it is more difficult to turn (a condition which can be equalised by the use of more horses), but because, owing to the greater fineness

of the particles, there is less opportunity for the effects of the weather to be brought to bear on the inside.

The depth of the furrow, also, must be regulated by the condition of the soil and nature of the future crop. It is very difficult to state a hard-and-fast size for a furrow, because on land very similar in appearance, even on the same farm, it is necessary to work it at slightly different size and depth. As a rule, a furrow 8 in. by from 2 to 6 in. deep is best suited for ploughing to produce a corn-seed bed; 9 in. is a convenient width, and 10 in. is the limit of width for stiff land. The land will not invert, as a rule, if the furrow is as narrow as 7 in. Work, which would be too big if ploughed in 10 in. furrows with the ordinary plough, may be safely dug with the digging plough as wide as 13 in. The digging plough is not well adapted for ploughing clover-leys, which are to be sown within a short time with wheat, as the surface would not be rough enough, and the soil would lie too lightly. Fallows, which are ploughed in autumn and the early part of winter, may be ploughed to a greater depth and width than would be safe for corn crops, as the furrows will be a long time under the influence of the weather. From 10 to 12 in. in width, and from 6 to 8 in depth, is an outside limit to the size of a fallow furrow for ordinary purposes. For special purposes a deeper furrow is occasionally made. The size of a furrow is not so important as the quality of the work; the great point to guard against is coarseness. A small furrow may be coarse and a big furrow may be fine, or well-proportioned. Coarseness is the result of setting the furrow wheel too deep. To realise

the effect of this, the mode in which the cutting is done must be understood.

If a piece of ploughing is observed it will be seen that

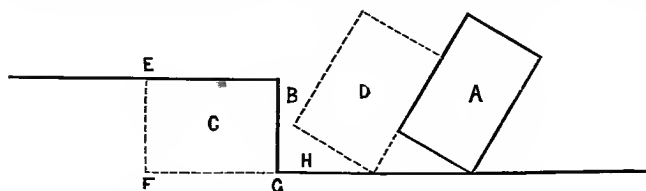


Fig. 25.—Section of a piece of land being ploughed.

the last furrow turned (A) was taken from a corresponding space (B). The open space between the solid ground and the turned furrow is called the horse-walk. When the next furrow is made the block (C) will be converted into the furrow (D). To effect this the two dotted sides will have to be cut. E F will be cut by the vertical coulter. F G will be cut by the horizontal share, and the inversion will be performed by the curved mould board. As the depth of the ploughing is mainly regulated by the furrow-wheel on the horse-walk side, and by the land wheel on the coulter side, it is evident that to get an evenly cut horse-walk the plough must be regulated by these two wheels. If one of these wheels is altered so that it raises or lowers its side, it is evident that the horse-walk becomes uneven. The vertical side at G requires no cutting if the plough is set level, but if the furrow-wheel is raised so that the plough sinks on that side, there is a portion below the horse-walk which must be broken out. If the land is not most friable it will not break off at G, but will affect part of that at H. This adds considerably to the labour of the horses; and as the part which is broken up comes from a lower stratum, it

is probable that obnoxious matter will be brought up. There is no detail in ploughing which has so bad an effect on the work as the too deep setting of the big wheel, for in addition to the bad effect already mentioned the furrow is flung down so that instead of presenting an acute angle, it lies flat, and will be difficult to work subsequently, and the beneficial effects of the weather will not be obtained. The work is made more easy for the horses in accordance with the shallowness of the cut on the vertical side G. An acute angled furrow is obtained by making the side E F deeper than the side G. It is easy because, instead of a portion below G being broken up, the furrow falls easily over without obstruction.

TYPES OF FURROWS.

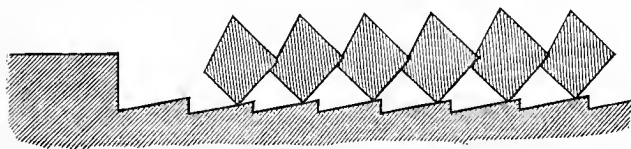


Fig. 26.—Section of Rectangular Furrows.

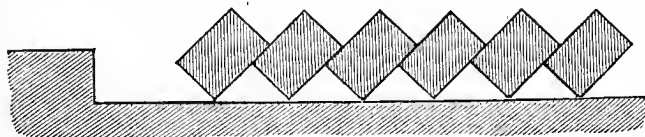


Fig. 27.—Section of Trapezoidal Furrows.



Fig. 28.—Section of Wide Broken Furrows.

The illustrations Figs. 26, 27, and 28, represent the three

types of furrows commonly made, and a departure from these is generally a step in the wrong direction. The rectangular furrow is the one most commonly adopted, a fair amount of surface is exposed, the furrows lie compactly, surface rubbish is well buried, and the sole of the furrow is level, thus allowing the water to run freely from the top to the bottom of the ridge.

The crested furrow exposes a greater surface than the preceding type, and is therefore more influenced by the weather and is more easily worked to a seed bed; on some soils there is a difficulty in making the furrows pack together neatly, consequently, the surface rubbish is not well covered; another objection is that on the land lying in ridge and furrow the notched sole hinders the water from running freely to the water furrows, also, when cross ploughing, or turning the furrows back subsequently, the ledge left has to be cut, and this adds materially to the work; besides, a raw piece of soil is brought to the surface, which is objectionable because it will work harshly and tend to spoil the quality of the seed bed. At the same time the crested furrow is far better than a compressed furrow laid flat.

The broken furrow turned by the digging plough is the most suitable form for all but a very limited number of purposes. On very light soils it is desirable to consolidate the seed bed, and generally it is advisable to consolidate a seed bed to be sown with wheat. At present there are many farmers who, basing their judgment on the experience obtained with flat furrows made by the common compressing plough, do not favour the digging plough for winter fallow ploughing; but their number is rapidly decreasing, as they see how well the dug furrow turns out

in the spring. For all other seed beds the digging plough is far superior to the common plough, as the action of the digging breast is to loosen and disintegrate the particles of soil, and so produce a kindly tilth easily affected by frost, rain, and sunshine.

Fields are ploughed in sections called lands, which are made in varying sizes according to the nature of soil and subsoil. Where the land is light, and the subsoil affords free drainage, it is usual to make each "land" 22 yards in breadth. On heavy soils it is found necessary to lay up the land in ridge and furrow, so that the water may be shot from the ridges into the furrows, and be carried away by the water furrows. Where there is a fairly percolative soil, the lands are made as broad as 10 yards; but as the soil and subsoil become heavier, and percolation more difficult, they are narrowed to as little as 5 yards. As the drains are laid along the bottom of the furrows it is necessary to carefully retain the position of the lands, otherwise the efficacy of the drains will be impaired.

Messrs. Howard give the following directions in their catalogues, and they well repay perusal:—

"Ploughs with two wheels should, in turning at land's end, be balanced on the furrow wheel.

"In ploughing the last furrow, the land wheel is turned inwards or drawn up out of the way.

"On wet, sticky soil, where the land wheel clogs, a slide foot may be used instead of the wheel, and a short breast, which turns the furrow more quickly, will be found more suitable than a long breast.

"If ploughs run too much or too little to land, a piece of leather should be placed between the beam and frame

either round the front or hinder bolt, so as to throw the beam to the left or right as required.

“ In very hard land, ploughs will go more easily if the draught chain is lengthened three or four feet.

“ When the ground is hard or stony, a share with long point should be used, and as the point wears off, the lever neck must be raised into the higher grooves.

“ On clay or soft land, or when ploughing without wheels, a share with short point should be used, and the lever neck fixed into the lower grooves: the head or draught chain should also be lowered, so as to prevent the wheels cutting into the ground.

“ The skim coulter should be set so as only just to clear the herbage on the surface, the shallower the better; the hinder part should not be too high from the ground, but set as level as possible; in ploughing the *coming back* furrow, after drawing the first on the ridge, the skim coulter should be set moderately deep so as to effectually bury the grass.

“ A drag chain should be used on ley ground, and when ploughing in green crops, stubbles, and long dung.

“ On reaching the end of the furrow, a plough should not be lifted by the ploughman to the next piece, but brought out by simply pressing on the handles, and so using them as a lever. The plough is thus turned over on the right-hand side, balanced on the large or furrow wheel, *not the small or land wheel*, and so drawn towards the next piece. The turning can be done by a boy, being more a matter of skill than of strength.

“ The breasts of the Howard ploughs are generally fixed on the right-hand side, consequently they turn the furrow slice on the right-hand side only. It is therefore

necessary to work in ridges or lands, the width of which may be varied from 8 ft. to 66 ft., according to the climate and nature of the soil.

“ Perhaps the best mode of ploughing in dry climates with these ploughs is in 22 yard lands as described below :—



Fig. 29.—Method of Setting out Light Land Ridges.

“ Step off from left-hand boundary of field 22 yards, as shown in the above sketch. Divide this into two equal lengths of 11 yards each. Divide again that portion nearest the hedge or boundary into two equal lengths of $5\frac{1}{2}$ yards. Upon the centre of this, marked A, throw a furrow slice from each side to form the ridge B. Keep ploughing round the ridge B till $5\frac{1}{2}$ yards are done each side, as shown on above diagram. This first piece being finished, step out 22 yards from the middle of the ridge B ; this distance will be $5\frac{1}{2}$ yards beyond the first division of 22 yards, and its extremity forms the centre for the new ridge E. Proceed to make ridge E, and plough round it $5\frac{1}{2}$ yards on each side as in the former case. There will then be 11 yards of unploughed land between the two ridges B and E, which proceed to plough out first on one side and then on the other, until the work is finished in the middle, where there will be an open furrow S.

“ Now proceed to step out 22 yards from the ridge E, to get the centre for the new ridge F ; make a ridge on F, and

plough round it $5\frac{1}{2}$ yards one ach side as before ; then $5\frac{1}{2}$ yards on the right side of ridge E being already done, there will be 11 yards of unploughed land between the two ridges E and F, which plough out as before.

“ From F step out 22 yards to form the centre of another ridge, and so on until the field is finished.

“ If it should happen that an odd piece is left over on one side, a separate ridge must be made for it.

“ Where the fields are large, set out all the ridges first, so that several ploughs can work together in the same field.

“ Change the position of the ridges at every fresh ploughing, beginning the new ridges in the old furrows.

“ The following table gives some idea of the saving in time by using ploughs which take two or more furrows at once.

“ For the purpose of the calculation, the length of the furrow is taken at 220 yards, and the width of the plots or ridges at 22 yards.

“ With the headlands at 6 yards wide, the horses have to travel $5\frac{1}{2}$ yards across each, and the same in turning.

Width of Furrow Slice.	Single-furrow Turnwrest Ploughs.	Swing and One-wheel Ploughs.	Two-wheel and Steerage Ploughs.	Two-furrow Steerage Ploughs.	Three-furrow Steerage Ploughs.
Width in inches.	Miles in an acre.	Miles in an acre.	Miles in an acre.	Miles in an acre.	Miles in an acre.
8	13	$13\frac{3}{4}$	$13\frac{1}{4}$	$6\frac{5}{8}$	$4\frac{3}{8}$
9	$11\frac{1}{2}$	$12\frac{1}{4}$	$11\frac{3}{4}$	$5\frac{7}{8}$	$3\frac{7}{8}$
10	$10\frac{3}{4}$	11	$10\frac{3}{8}$	$5\frac{1}{8}$	$3\frac{1}{2}$
12	$8\frac{1}{2}$	$9\frac{1}{4}$	$8\frac{7}{8}$	$4\frac{1}{8}$	3

“ With two-furrow ploughs, the horses travel the segment of a circle from the end of the completed furrow to the commencement of the new furrow, and on an average

travel $16\frac{1}{2}$ yards, thus saving about 8 yards at each turn, as compared with single-furrow ploughs.

“In the United Kingdom the most usual method of draught is to attach horses abreast in pairs with trace chains and whipple-trees—the trace chains under some circumstances working better when crossed—but on stiff soils the horses are often harnessed in single file, and follow each other up the open furrow, so as to avoid treading the surface soil.”

“Heavy land where the water cannot percolate freely into the soil has to be ploughed in small lands, so that the water may be quickly conducted to the water-furrows, which are made at the bottom of each land, and below which the under drains are placed. According to the stiffness of the soil and subsoil, these lands vary from five to eleven yards in width, and the top of the ridge should be a considerable height above the furrow. To maintain the ridge the ploughings should be arranged so that the land is ridged five times whilst it is cast four. An extra ridging is necessary because of the tendency there is for the soil to fall down when harrowed and otherwise worked. The maxim to follow is to ridge it before winter, and cast it in the spring. If cast in the autumn it is most probable that owing to its flatness it will be waterlogged during winter, when a large quantity of rain may be expected to fall.

“When using a turnwrest plough the furrows are all turned in one direction, thus only one ridge or setting out is required, and that is at the outside of the field.”

The first furrows of lands (or the ridge setting) are laid in various ways. The simplest is merely to lay up the first furrow on each side, as in Fig. 30. The objection to

this form is that the whole ground at (K) is not moved. A more thorough method is shown in Fig. 31, where the whole of the land is moved:—

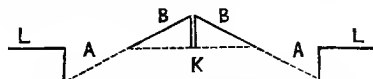


Fig. 30.—Section of Simple Setting.

- L.* Surface of land.
A. Horse-walk, or place from which furrow was cut.
B. Furrows laid up so as to form ridge or setting.
K. Unploughed land.

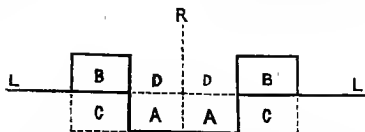


Fig. 31.—Section of Split Ridge Setting.

- A.* Horse-walk.
B. Furrows turned back right and left from (A).
C. Second furrow (B and C) being turned back together to (D), so as to meet at
R. Middle of ridge.

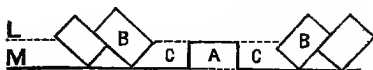


Fig. 32.—Section showing Last Furrow to be Ploughed.

- A.* Last furrow.
B B. Last furrows turned right and left.
C C. Horse-walks.
L. Surface of land.
M. Bottom of furrow.

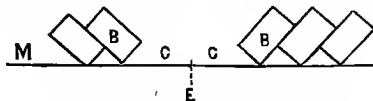


Fig. 33.—Section showing Open Finish.

- B B.* Last furrows turned.
C C. Two horse-walks, forming open finish.
E. Middle of finish.
M. Bottom of furrow.

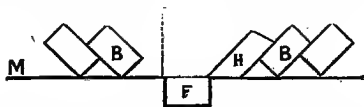


Fig. 34.—Section showing Mould Furrow Finish.

- B B.* Last furrows turned.
E. Line where coulter ran when making the mould furrow.
M. Bottom of ordinary furrows.
H. Mould furrow.
F. Water furrow.

In Fig. 30, the two first furrows are laid up so that their upper edges meet. In Fig. 31, the two first furrows are split open, so that there is a double horse-walk (A A). When these are turned, the plough is made to run so that the first furrow, and a furrow underlying it, are both turned back into the horse-walk. The only objection to this is that the set ridge is too high for neatness; however, this is remedied by using a fork and throwing back (B B) on to the unploughed ground, when only (C C) go back into the horse-walk, and the ridge is of normal height.

Lands are finished in various ways, and the recognised finishes are the open furrow, the mould furrow, and furrow back. Fig. 32 represents a section of the land where there is still another furrow to be turned. In an open furrow finish the last furrow has been turned to B (Fig. 33), the plough coulter having run along the furrow at the point E. To convert the open furrow finish into a mould furrow finish (Fig. 34), the plough is taken down an adjoining land, and is then brought back so that the mould furrow is turned back in the same direction as the last furrow; this is done because the slide makes a depression which acts as a guide easy to follow, and the furrow is more neatly turned. The water-furrow (F) should not be too deep, but should be well scoured out; the mould-furrow will not lie as high as the last furrow, but it should fit in neatly with it, and should be definitely shown. The objection to water-furrows is that the reaping-machines are liable to be shaken by dropping into them at harvest time; but as on some soils it is absolutely necessary that a means should be provided to clear the land of surface water, the difficulty is partially met

by making the water-furrow as shallow as possible ; deep, coarse water-furrows are rarely made.

The furrow-back finish is made by turning one or more furrows back into the open furrow finish ; the furrows B B in Fig. 33, being turned back into the horse-walk (C C.) This is done so that there will not be a strip of land left bare of soil. When the furrows are harrowed down very little depression is seen along the finish, and the crop is almost as good as on the main part of the land. It is particularly suitable for spring and summer ploughing ; but is objectionable on heavy land in winter.

In wet weather, the last few furrows on each land should be ploughed with the horses tandem and not abreast, so that the injurious effect produced by treading on the newly-formed furrows may be avoided.

When ploughing very wet and sticky land, where the soil adheres to the land-wheel, it is found convenient to use a leg and foot in its place. They are simply an iron leg or standard with the bottom part curved backwards and beaten out flat.

Parts of the Plough.—In Fig. 35 is illustrated an ordinary single-furrow plough, the parts of which are common to ploughs of this type, consequently, it is well that their significance should be understood.

The functions of the several parts are as follows:—The beam, to which are attached the handles at the back end, used for steering and balancing, carries all the parts of the plough, and when putting the parts of the plough together should be at once attached to the frame or body. If the wheels are then attached the remaining parts may

be readily affixed. The T-head, a notched quadrant, together with the hake and chain, constitute the parts by which the plough is drawn. If it is desired to make the

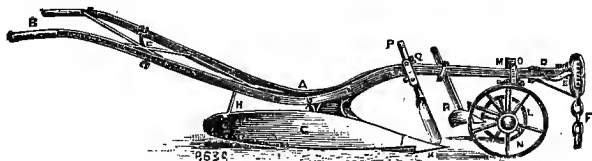


Fig. 35.—The Common Plough.

- | | |
|---------------------------|---------------------------|
| A. Beam. | K. Share. |
| B. Handle or stilt. | L. Land-wheel. |
| C. Handle-stay or brace. | M. Land wheel standard. |
| D. T-head. | N. Furrow-wheel. |
| E. Sliding-head. | O. Furrow-wheel standard. |
| F. Draught chain. | P. Coulter. |
| G. Breast or mould-board. | Q. Coulter-clip. |
| H. Breast-stay. | R. Skim coulter. |
| I. Mould-board rest. | |

plough tend towards the left the hake is made to slide to the right, and is pinned down in the required place; and *vice versa*. Should the plough tend to run down too deeply, notwithstanding the position of the wheels, the chain is placed in a lower notch, and the balancing becomes more easy. The depth of the furrow, however, is mainly regulated by the wheels. The big, or furrow wheel regulates the depth on the furrow side, and also, with the coulter, regulates the width of the furrow, for the furrow consists of that piece of land which lies parallel between the two; the small, or land, wheel controls the depth on the land side. The coulter makes the vertical cut of the furrow; and the skim coulter pares off a thin slice of soil when it is desired that a portion of a weedy surface should be buried. The body carries the remaining portion of the ploughing parts. The share is a moveable point to the body, and cuts the underside of the

furrow. Fitting up to share, and forming a continuation, is the breast, which in ploughs of this type is a bent sheet of steel taking the shape of a flat strap turned nearly over. The breast is fixed to the frame by adjustable parts, which allow it to be expanded so as to suit the style of work desired. Important parts not shown in Fig. 35 are the slade, which is placed under the frame, and bears the brunt of the friction at the bottom of the plough; and the side-cap, which forms a protection to the land side of the frame, and tends to keep the edge of the unploughed land vertical; these are both moveable parts and can be replaced when worn.

The Digging Plough (Fig. 36) is much more simple in its construction, and several parts represented in the ordinary plough are not required. The breast is concave rather than convex; it is shorter, and at the fore part is made with a knife-edge, which acts as a coulter, though the straight-edged skim coulter assists the edge of the breast in making the vertical cut. The same practices with respect to altering the depth and width of furrows are followed in both types of plough.

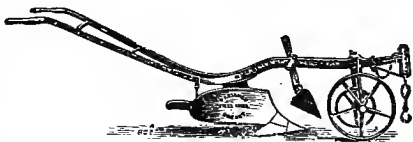


Fig. 36.—The Digging Plough.

Ploughing Competitions.—It is usual in ploughing competitions for each team to have to plough a certain extent of ground in a given time and in the most workmanlike condition. The workman has to set out his land without assistance, and, so that a thorough test in starting and finishing may be given, he

has to arrange so that there may be two ridges and one finish. The more experienced ploughmen frequently have to plough a furrow 20 chains in length, the less experienced from 10 to 12 chains, and boys from 6 to 8 chains. The first class consequently have very few furrows to turn in the half acre which is ordinarily set them to plough, and if they do not draw their first furrows accurately, have little chance of rectifying errors. This becomes more apparent when it is understood that on the narrow piece of ground given to be ploughed two ridges have to be set, so that it is divided into two lands, consequently there are often not more than eight or ten furrows on either side to be ploughed.

Points in Awarding Prizes.—The points which are considered in awarding prizes for ploughing with the ordinary plough are straightness, equal size of the land, a good ridge at setting out, a good finish, neatness of furrow, equal size of the furrows, freedom from coarseness of the furrows, furrows adapted for the particular crop for which the ploughing is done, a good crest on edge to the furrows, furrows well packed, surface rubbish well covered without the furrows being too flat, a good setting in at the land's end, flat sole to furrow, square cut to land side.

The points for ploughing with the digging plough are not so definitely decided, as comparatively few competitions to exhibit the skill of the ploughman have been held, though they will have to take a place in future competitions. At the contest between manufacturers held under the auspices of the Royal Agricultural Society at Warwick in 1892, the following is the list of marks

awarded [for merit in the essential properties of the ploughs :—

Price	...	...	...	...	...	...	10
Mechanical qualities and strength	...	...	...	...	...	...	20
Simplicity	...	...	...	...	...	...	10
Draught relatively to work done	...	...	...	...	...	...	20
Flatness of sole of furrow	...	...	...	...	...	...	10
Perfection of work of bringing vegetation	...	...	...	...	...	...	25*
Efficiency of skim coulter	...	...	...	...	...	...	5

100

These points give little guide to the workman. As in ordinary ploughing—straightness, equal size of lands, a good ridge at setting out, a good finish, a neat furrow, furrows of equal size, furrows adapted to the particular work, surface rubbish well covered, a good setting in at the land's end, and a flat sole to the furrow, must be considered. The coulter of these ploughs is not necessarily vertical, so the square cut on the land side is not essential. The furrow should not be wider than the share can cut cleanly, or thistle roots and other weeds will not be cut in two. There is a great difference between a furrow suitable for making a seed bed and one which is to be untouched through a winter fallow. In the first case the land must be broken up as finely as possible, and probably the spreader, or knife, attached to the back part of the mould-board must be used to level down the surface. However, the condition of the soil as regards moisture and tenacity, consequently, of the kind and quantity of work required to bring down the land to a good seed bed, must be considered. The kind of

* Perfection of work being : to make a good seed bed ; to do work best adapted for the purposes of winter fallow.

seed bed, whether, for instance, for wheat (which requires a firm bed), or barley, or roots (which requires a tilthy seed bed), must also be borne in mind. In the case of the furrow for a winter fallow, it is almost safe to say that it will be best if left in a rough condition, so that it may receive the full benefit of atmospheric changes.

Straightness of the first furrow, or, as the process is often called, "drawing," is never attained by some men. The best training is by practice without a team; learn to walk straight from point to point. Hoar frost and heavy dews afford good opportunities for ascertaining a man's straightness, for his footsteps can be traced; and there is no better training than is afforded in this way. When practising, the beginner must learn to pick up "middle marks," that is, to carry in his eye different marks, such as stones, tufts of grass, &c., which are in a line with the mark to which he is drawing, for by keeping these in a line he cannot go wrong. Intentionally placed middle marks are not allowed, but the competitor must discover them as best he can.

Setting the ridge means laying up two furrows turned towards each other as in Fig. 30. The ridge must not be set too high, as it is unsightly, and is not such good work as one set neatly.

A good finish is a most essential point in the competition. The last furrows must not be too coarse; the water-furrow must not be too deep, and the mould-furrow must be neatly laid up to the last furrow. The extent of land on either side of the water-furrow must be equal. To attain this the two ridges must be set to permit it. It is obvious that if the land between A B in Fig. 37 is to be ploughed in two equal ridged lands, with an open

space of 8 inches at C (water-furrow), that the side of the two set ridges E E is not exactly one-fourth of the distance between A B, allowance must be made for the open furrow.

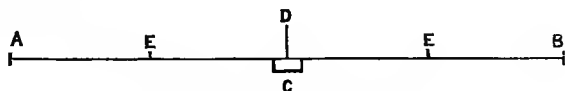


Fig. 37.—Measuring out lands.

Consequently, when 8-inch furrows are to be ploughed, 8 inches less must be allowed for. To obtain this the space between D (the middle of the land to be ploughed) and E, on both ridges, must be 4 inches less than that between E A and E B.

Neglect to set out the lands properly has been the most frequent cause of disqualification in competitions, for it is considered by judges to be absolutely imperative that the two lands should be exactly equal. The other points detailed call for no special remarks beyond what have been stated in previous chapters; but so that the set ridges are not too high, it is usual to plough the two first furrows somewhat smaller than the succeeding. It is necessary to have a plough perfectly straight in the beam. The coulter should be placed vertically, and should be straight, and with a knife-like edge, so that the edge of the work may be as smart as possible. A small disc coulter in front of the skim coulter greatly helps to smarten the work. The wheels should be perfectly upright, with no unnecessary play, and the legs or standards carrying them should also be quite straight. Sufficient links should be attached to the head of the plough to allow the ploughman the chance of attaching the whipple-trees as far from the plough as he desires, for

it often happens that a field of land varies very much, and the plough draws in an inch or two more at one end than at the other. When hooked very short the swaying of the horses' bodies makes it more difficult to hold the plough steady. The ploughman should be provided with a 2 ft. rule, and also with a rod 6 ft. long with the width of the furrow he wishes to plough marked on it. A square rod marked with 8 in., $8\frac{1}{2}$ in., 9 in., $9\frac{1}{2}$ in. notches is most convenient, but as it may not be possible to make either one divide exactly into the total width of the land, the furrow will have to be adapted to it.

CHAPTER VIII.

IMPLEMENTS FOR STIRRING THE LAND.

WHEN working scufflers or cultivators, which are regulated by wheels fore and aft, it is obviously necessary that the wheels should be set so that the tines work to the same depth; although this is so obvious, it is by no means uncommon to find great disparity in the depth at the two sides of the implement. The fore wheels regulate the pitch or angle at which the tines are set to the ground, and the way in which they are set is of the greatest importance. The work may be rendered heavy, and yet the result may be less effectual than when they are set properly, so as to draw into the soil at an easy angle. All tines should be set at the same depth, and if one becomes strained it should be taken to the smith and rectified on the first opportunity. When land is scuffled twice, and it is inconvenient to work it at right angles so as to cross the work done at the first stirring, the scuffle should not be allowed to follow in the first tracks, but the horses should be driven so that they walk where the wheels of the scuffle went before; in this way any pieces missed on the first occasion will be caught at the second attempt. Harrows should be hooked evenly on to the beams so that the tines do not follow one another, but make a separate track. The tines should be kept clean or good work cannot be done. A hooked stick is convenient for lifting the harrows when in motion, but accumulations of dirt

and weed must be pulled off by the hand when at rest. Harrows are more effective when they are made to cross furrows; and when working land it is advisable, when possible, to harrow at right angles to previous harrowings. Horses drawing harrows should be driven by reins from behind, so that the driver can better see how the harrows effect their work.

Rollers and clod-crushers should be kept well oiled in the bearings. If the soil is sticky, the driver should be provided with a spade or spud to scrape off the accumulated dirt when required. Great care should be exercised when turning at the ends when the soil is loose, and there are freshly-sown small seeds or young plants on the field, or the mould will be shoved into a heap, and the crop destroyed. The sectional rollers now commonly used have made the work much more easy.

Whipple-trees or swivel-trees should be made in such a form that the work may be equally divided among the horses, or an extra share be put on the stronger. In most districts provision is made for this, but in some of the light-land districts, where horses are usually worked in pairs abreast, the whipple-trees are not made adjustable.

Various forms of whipple-trees are constructed, and many of those specially designed are made on good systems of compensation and adjustment; unfortunately, some are only good for use when the horses are in a particular position, and are useless when the horses are required in others. Those shown in Fig. 38 are well arranged, as a complete set is adaptable for single horse work, pair-horse work, and three horses or four horses abreast. The only drawback is, that in the event of

horses of unequal strength being attached, there is no means of giving more work to one than to the other.

Iron whipple-trees are lighter than those made of wood,



Fig 38.—Solid Iron Equalising Whipple-trees.

and are therefore preferable on that account. However, well-devised wooden ones are better than those of iron when not properly constructed. The illustration in Fig. 39, shows a good method of adjustment, though somewhat heavy.

Where the horses are to be driven in single line, the whipple-tree (A) should be attached to the plough. If two horses abreast, the set A B C are required. If two abreast, and one extra in the furrow, A B C are required; but to equalise the work, so that the horses

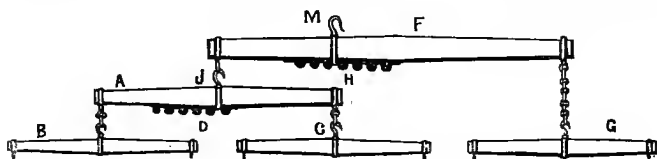


Fig 39.—Whipple-trees adjustable for two, three or four horses abreast; for two horses abreast and one extra furrow horse, etc.

each pull the same, the hook (J) should be moved to the left-end notch of the bar (D). If five horses are employed, one pair should be attached abreast to B and C; another pair should be attached in front of these by

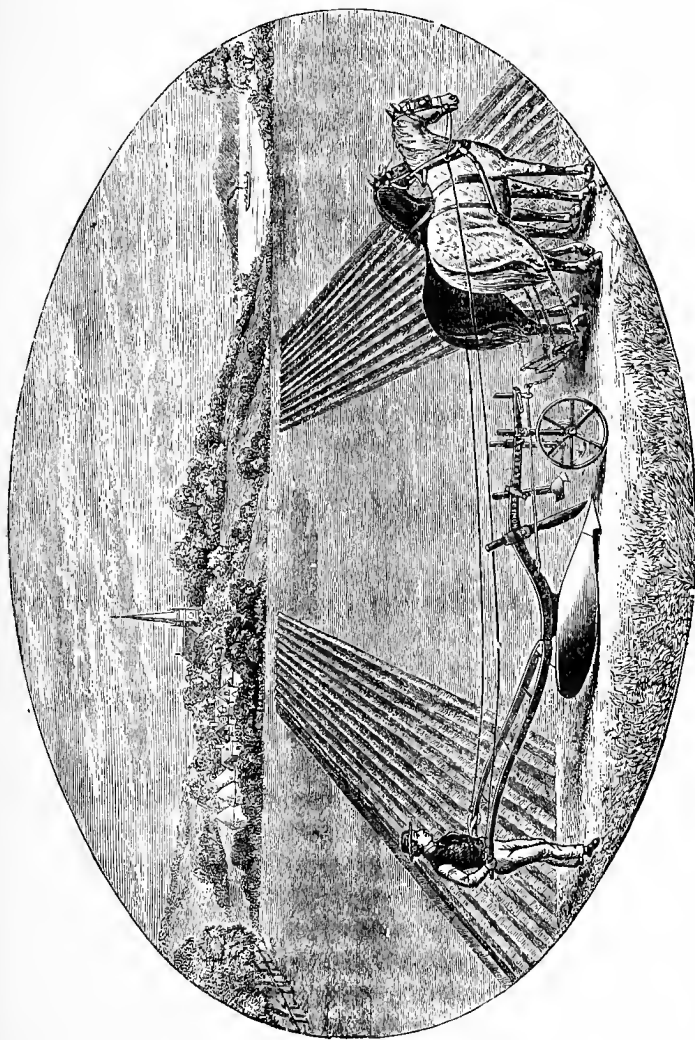


Fig. 40.—Harnessing Horses to the Plough.

means of chains, and the odd horse should be placed in front of this pair, attached to B. To regulate the draught of the horses, the hook (J) should be placed in the middle notch of D.

When three horses are worked abreast, F and G must be added. It is obvious that if the hook (M) were attached at the middle of the whipple-tree (F), one horse would have to pull as much as the other two, and means must be supplied to rectify this. Therefore, a notched bar of iron similar to D is attached to F, which allows the hook (M) to be placed so that the work is divided, two-thirds to the pair of horses, and one-third to the odd horse. By having several notches, horses of unequal strength may be made to take as much work as they can fairly do. Those who do not understand the laws of levers have probably had an illustration of the principle involved here, for when helping to carry a hare or a pail of water on a stick, they must have noticed that the one with the pail nearest to him had the bigger portion of the weight to bear.

Four horses abreast may be worked with an even strain if the hook (M) is placed at the middle of F, and another set similar to A B C is substituted for G.

Other forms of compensating whipple-trees are made, but many of them involve intricacies which prevent their common adoption.

The proper mode of harnessing and attaching a pair of horses to the plough is shown in the sketch on the preceding page. Special attention is called to the back bands which carry the chains, thus taking off the weight of the whipple-trees from the shoulders, thereby preventing chafing, which otherwise results.

CHAPTER IX.

MANURE CARTING; DIGGING; BROADCASTING.

WHEN moving farmyard manure a stout, crank-handled dung-fork should be used, as a greater amount of work can be done with it than with a long-handled fork. When filling from the yard, it is advisable to cut out blocks large enough to allow a cart to be backed into the space when it is cleared. An old hay knife should be used, and the little time lost in cutting will be quickly regained, especially if the dung is long, for the labour of pulling out long material is thus lightened, as there is not the continuous binding-in that exists where the long straw lies trodden in without a break all over the yard; also, the greater part of the dung has not to be lifted so high, for the wheels of the cart are always on the ground.

When dung is carted into heaps it is necessary to know for what purpose the dung is to be used. If it is desired that the dung shall be brought to a rotten condition in a short space of time, it must be put together as lightly as possible; but if it is required to be kept from fermentation, it must be stacked tightly and trodden down firmly. To induce fermentation the manure is thrown up into a heap from the cart, all unnecessary treading being avoided. This is called a "thrown-up" dung-hill; but when it is desired that the manure shall remain unchanged in condition a "drawn-up dung-hill" is made. Drawn-up dung-hills are made either in a horse-shoe shape or the

sides are made straight at right angles to the ends, the latter being sometimes called a "drawn-over" dung-hill,

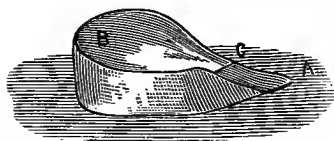


Fig. 41.—A Drawn-up Horse-shoe Dung-hill.

because the horses are led up the incline (A), the manure is tipped out bodily on to the heap, and the cart is drawn down the sharp incline (B).

When the horse-shoe is adopted the carts are drawn up the narrow tongue (A), and are emptied on the heap; but instead of going over the heap, as in the case of the drawn-over hill, they are led round by B, so that there is only one tongue. This form is somewhat dangerous if the hills are small, as then there is not much room for turning. In each case the dung becomes well compressed. As a rule the tongue (C A) in each system is cut off with a hay knife, and thrown back on to the heap between C B, so that the surface (C B) is horizontal. The builder should work energetically so that the contents of the carts are spread out evenly, otherwise the horses sink to a great depth, and in their endeavours to get out strain themselves. Many horses have put their stifles out of joint because the heaps have not been well worked in this way.

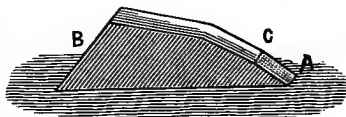


Fig. 42.—A Drawn-over Dung-hill.

When farmyard manure is carted on to the land the heaps should be made systematically. As a rule heaps laid 8 yards by 8 yards square are most convenient for spreading; but when the excessively heavy dressings

such as market gardeners apply are put on, the heaps are inconveniently large; 6 yards by 6 yards are better.

Digging.—Digging is effected by the spade, fork, or spade fork. Digging tools should be made with a slight



Fig. 43—Spade.



Fig. 44—Fork.



Fig. 45—Spade-Fork.

crank or bend in that part of the shaft near to the tread so as to afford leverage; when the tool is driven into the ground the upper part of the tines or blade form a fulcrum, so that when the handle is pulled towards the digger the spit or spadeful of earth is levered out of the ground much more easily than if it had to be lifted out by sheer force. The spade-handle shaft is much preferable to the long, straight handle met with in some districts, which is commonly spoken of as the “lazy man’s” fork, because it is used by men too lazy to stoop, though, as a matter of fact, it entails harder work on the user, as all

the work falls on to the arms instead of the greater part being taken by the back. It is impossible for a man to get through as much work by his arms alone as when "he puts his back into it," just as in rowing a man cannot sustain a long pull if he merely rows with his arms. The spade-handle also affords greater power to the wrist than can be obtained from the grasp of a straight shaft. In the use of all light tools the wrist plays an important part, as it allows a man to work dexterously and freely, and not stiffly and slowly. The loy, commonly used in some parts of Ireland, is a very primitive tool, which may be aptly described as a stout pole shod with iron, for it is little else; yet those who are accustomed to using it believe it is the most serviceable tool they can get, and are slow to acquire the use of those of more labour-saving make. In some districts the loy, the blade of which is only from 3 to 3½ in. in width, is almost the only implement used in cultivating the small farms; but there is a tendency in the more enlightened districts in the north to adopt those which in other countries are found to do the work more easily and more efficiently.

The spade is used for digging medium and dry soils free of roots of weeds which require to be shaken free from the earth and to be gathered off, or for burying surface rubbish or manure which requires to be smothered underground. The fork may be used with advantage when digging weedy land containing the roots of couch, snake weed, wheat-bine, or other plants possessing roots which, if left in the ground, would conduce to its foulness. Also for digging stony ground where it is difficult to force in the broad blade of the spade.

The spade fork is a most useful tool, and it is not used

nearly so often as it should be. It is peculiarly adapted for digging heavy and wet ground; for, while under such conditions the ordinary spade becomes so covered with sticky earth that it can only be used with great difficulty and to little advantage, and the ordinary fork does not clean out the underground, the spade fork works freely and effectively. The bar attached to the bottom of the tines cuts cleanly, and the open form of the tines does not allow the dirt to accumulate. When ordinary fork-tines have become shortened by use, a bar of steel should be riveted to them, and an efficient tool will be gained.

The shovel is used for moving loose material. The sides are raised to keep the material from falling off; as it is not made so rigidly as the spade, it should not be used to dig hard ground.

The navy's spade or shovel is well adapted for moving gravel or similar material, being



Fig. 46.—Navy's Spade or Shovel.

especially constructed for the purpose. It is not made for digging ground. The blade is composed of hard material, is somewhat rounded at the bottom, and the blade is not flat, but slightly dished. The sharper point permits the blade being pushed into the heap more easily than is possible with a square edge. It is a rule when shovelling or forking any material that the operator shall be "inside his work"; that is, if the row or heap of material is to be moved to the right the man shall be on the left, where possible, as he can exercise greater power, move the material further than when behind or outside it, and he will work more easily and more effectively. It will, perhaps, be better understood by stating that in moving

a heap of material towards the left the right should be uppermost, and when moving to right the left hand should be uppermost. This applies equally when turning rows of hay, corn, &c., with a fork, or heaps of grain or gravel with a shovel. It is impossible to use hand tools neatly and dexterously if this rule is not observed, but novices do not always realise it.

The potato shovel is somewhat like a large fork with a

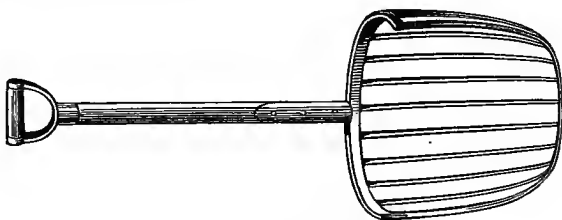


Fig. 47.—Potato shovel.

narrow bar running along the foot of the tines. There are several tines which are so arranged as to form a scoop. The bar at the foot prevents the potatoes from being struck, and the space between the tines allows the dirt to fall through.

The caving fork is commonly used for moving cavings

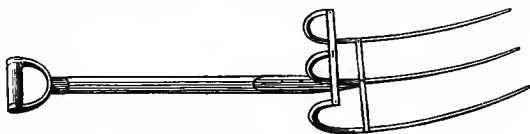


Fig. 48.—Caving or cocking fork.

and short straw, especially while threshing. It is also used for gathering together barley and other crops with short haulms into heaps or cocks in readiness for pitching

on to carts. No other tool can be worked to so good advantage, as the tines are long, and the rack at the back prevents loose pieces from slipping off. They may be used with great benefit to pick up or move clover seed in the field, as they slide easily under the heaps, avoiding the threshing out of the seed which occurs when an ordinary fork is employed.

Light hand-forks are commonly spoken of as pitch-



Fig. 49.—Two-tined fork.

forks. Technically, this is incorrect, for pitch-forks are big forks specially made to pick up large heaps of hay or corn and to pitch them on to the cart or wagon. In the hands of an inexperienced workman pitchforks appear to be clumsy, and the work is done in a slovenly manner. When picking up a heap of material the fork should be run a slight distance round the base of the heap, collecting a small piece of the material which will play the part of a band to secure the heap. The fork should be thrust well from top to bottom of the heap; but, before lifting the piece, the fork should be shoved well away from the body of the workman; then, if the fork is kept firmly in the mass, the whole will pick up cleanly and without waste.

When properly done, the whole of the process is apparently effected in an unbroken movement, and with great rapidity. A forkful lifted in this manner is a compact mass, and the pitcher should place it neatly on to the cart in the required position, when the loader's

duties will merely consist in treading the piece firmly down. A piece thrown indiscriminately on to the cart gives much trouble, and causes the necessity of two loaders where one should be sufficient.

The lighter two-tined forks are spoken of as emptying forks, or, when used for pitching tied sheaves, loading forks. These are the ordinary forks, and the best way to learn to use them easily and dexterously is to work them among light material such as hay.

THE DIBBLE.

The Dibble, a short piece of wood, shod with steel at the lower end, is employed to make holes, into which cabbage and other small plants or seeds are inserted. The upper part of a spade handle makes a first-rate dibble; but a piece of wood formed 7 shape is often employed. Great celerity is attained by some men in the use of the dibble; while in many districts cabbages, kale, kohlrabi, and other valuable plants are rarely grown, because farmers say that their men are so slow and clumsy in its use that the expense is too great. The best dibblers are the market-garden labourers, especially those who are engaged for long periods every winter in transplanting small turnip plants to produce seed. From long experience, and after trying practically all the methods in vogue, they are unanimous in saying that the following is the most expeditious method to adopt:—These men generally work in gangs of five or six, and one man drops, or, more accurately, scatters, plants for the others, each man taking a turn at dropping, so as to gain a slight rest. In a short time a man becomes very skilful in dropping. He carries the plants in a

large scuttle or basket suspended from his neck, then seizes as many plants as his hand will hold, and throws them out so that they fall singly at the required thickness. The planters never handle more than one plant at a time, and never pick up a plant which lies wide on their right side. This is one secret of their greater rapidity of working. If they have to cross their left hand over their right, it is only done at a loss of time, which, trifling in itself, makes so much difference in a day's work that they plant several poles less ground in the course of the day. The planters work so that they always have the planted ground on their right side. To effect this, after working across the field, they do not come back close to the planted rows, but leave a space, and fall in some distance—generally about a chain—away. They turn to the left at reaching the land's end, and walk along the headland until they fall into their work, in the same way that horses are turned to the left to join their work when "casting" a piece of ploughing. If, as they work along, they notice a plant too far to the right, they flick it inwards with the dibble, so that no plants are wasted.

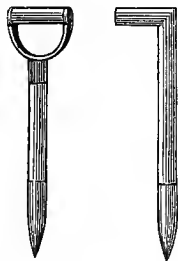


Fig. 50.—Dibble (the bottom shod with steel).

The long tap-roots of plants should be cut off; this is easiest done at the time they are drawn from the plant bed, as then the roots are in one direction. A pair of sheep shears are most suitable, and the roots from a large handful of 200 plants may be cut off in less than half a minute.

The holes should be well made, and the plant put into

them in such a way that they do not turn up at the bottom; earth should be knocked around the roots by the dibble, and the planter should consolidate the earth around the roots by placing his heel firmly on them. With very little practice the "heeling in" causes no hindrance, the action becoming a natural part of the stride. To ensure good results the heeling in should never be omitted.

As there are 4,840 square yards or 43,560 square feet in an acre, if plants are set 2 ft. apart "on the square," each plant stands on 4 square feet of ground, thus 10,890 plants are required. If plants are set 3 ft. apart on the square, only 4,840 are required. But as in the case of transplanting for turnip-seed they are planted a foot square, 43,560 plants are required.

As the workman is working with his body bent he is very liable to contract a chill about his loins, and various kidney complaints often arise from this. Those frequently engaged in dibbling always guard against chills by tying a sack on to their backs, fastening it round their waists. Neglect to do this so frequently causes illness that those less experienced should not fail to copy those who know what advantage is gained by taking the precaution. It is advisable to do it in all weathers, but, of course, specially so when showery.

Corn is sometimes dibbled, but as a rule, beans are the only crop extensively planted in this way. Beans may be dibbled when the land is too wet to carry a drill and the horses to pull it. When the single dibble is used the dibbler carries the corn in a bag attached to his waist, and drops a few grains with the left hand into a hole made by the dibble held in his right hand. The

double dibble consists of two separate long - handled dibbles, one of which the dibbler holds in either hand. The dibbler walks backwards and makes the holes at the same time; he strikes the ground with the two dibbles simultaneously, taking care to make the holes vertically; and, so as to make the holes clearly, he gives a turn of the wrist while the dibble is still in the ground. He is followed by boys called droppers, who drop the kernels into the holes. A harrow is needed to cover in corn that is dibbled, and if the ground is wet, a horse with small feet should be selected to draw it. The double dibbles are



Fig. 51.—Dibble used in the double dibbling.

made of iron, and are about $2\frac{1}{2}$ ft. in length, the bottom portion being made somewhat egg-shape.

Broadcasting.—The introduction of horse and hand-power broadcasting machines has rendered sowing by hand a less important practice than it was a few years ago. Still, there are those who prefer hand-seeding, and, where men are skilled in it, the work done is sufficiently accurate for all practical purposes. The seedsman carries, supported round his neck, a wicker scuttle or basket work, a zinc seedlip, or a seeding-cloth, according to the district he happens to reside in. Either one answers the purpose. The vessel contains the grain he wishes to sow; and, according to his strength, he carries from half to a whole bushel of seed. It is necessary that his arms are free, so that he may take up the grain and disperse it with freedom. The chief art is in holding the grain. A man with a short, thick hand

rarely makes as good a seedsman as one with a longer, more pliant hand. The grain should be grasped by the hand, and the arm be brought back well behind the body, care being taken that, while it is moving back, no grain falls ; otherwise there is an undue quantity distributed near to where the man walks. Then the arm should be swung forward and slightly upward, so as to make a semi-circular sweep. The arm should swing forward at the time the leg on the same side moves forward, as the work is then less laborious.

As soon as the hand is started forward the fingers should be opened so that the grain is broken in its dispersal. When it is thrown bodily out of the hand without passing through the fingers it is liable to keep too closely together, with the result that it falls in a narrow strip, causing the crop to appear ribbed. The seeding may be done with one or both hands, the more skilled usually adopting the double-hand method. The width of the cast should be just as wide as the man can conveniently throw it to ensure regularity. A man with a short arm does not swing so wide as a tall man. It is very necessary that the casts meet each other properly. A bad seedsman either overlaps his casts or does not join them, thus making bad work. When sowing on furrow or ridges the seedsman can often keep his width without having it indicated to him ; but if he has no such guide he requires one or two boys to walk along the outsides of his casts, slightly in front of him, to show him how wide the cast is. The quantity put on should be regulated by the length of the stride and the amount held in the hand. If the seedsman is in doubt as to the quantity he is sowing, he should make a calculation when he has sown half an

acre, and regulate his seeding by it. When sowing small seeds—such as onions, clover, &c.—it is usual to sow them from between the thumb and finger and to take a small cast, the seedsman generally stooping, to make his work more accurate.

CHAPTER X.



POTATO PLANTING.

It is necessary to keep potatoes in a sound and healthy condition throughout winter when it is desired to employ them as sets for planting. They should be chosen from sound lots, and be carefully protected from frost. Small quantities may be kept in warm cellars, but for practical purposes a clamp is most suitable. Pits are not advisable, as water is liable to drain into them, but a shallow depression, 6 ins. to 8 ins. deep, may be ploughed or dug out, and the earth thrown out will be useful as a covering. The clamp may be of any length, but the most convenient dimensions otherwise are: base 4 ft. 6 in., and height 3 ft. to 4 ft., according to shape of the potatoes, for a long variety of potato can be piled more perpendicularly than a round kind. A layer of straw, which, when consolidated, is 6 in. thick, should be laid on the pile, and the whole should be overlaid with earth to the thickness of about 4 in. In very exposed positions an outside layer of straw or hedge trimmings is found advisable. The sets should possess their full vigour at the time of planting, and this is not obtained if they are allowed to sprout too freely in the clamp; the best way to retard the sprouting is to turn the clamp once or twice during winter. It is advisable to allow the tubers to sprout if it is desired to obtain very forward young tubers, but the sprouting must be done systematically, the tubers being

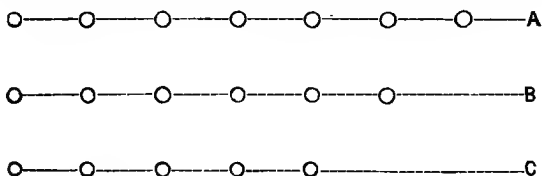
laid out singly with the rose end (the end having most eyes) upwards. The planting of sprouted potatoes must be executed carefully, or the sprouts will break off, and harm, rather than good, results.

Potatoes are planted in various ways, the principal systems being the lazy bed, the flat, and the ridge. The lazy bed is practised in Ireland and other places, and is suitable for land newly reclaimed and insufficiently drained. Beds somewhat similar to the ordinary asparagus beds are laid up, the earth from the trenches being used to form the bed; the tubers are set in the bed, and from time to time the trenches are deepened, the earth dug out being placed on the potatoes. The trenches form ditches to carry off excessive quantities of water, and on peaty soils, which rest on clay, the amalgamation of the clay with the peat is highly beneficial. By altering the position of the beds, the whole of the land is trenched and rendered more valuable. Except on peaty or moory soils the lazy bed is not so good as the flat or ridge system of planting, and should not be adopted.

The ridge system is very similar to the ridge system of root culture, the difference being that instead of drilling the seed on the ridge formed by splitting the ridge back over the dung, the potatoes are laid on the dung and the mould is turned over them. It is a highly successful method of planting, but is somewhat slow, as the dung has to be carted on to the land at planting time, which in late and unfavourable seasons causes great hindrance. The cleaning operations are easily effected.

The flat system is the most expeditious, and the planting is generally done by what are known as "spading-in" or by ploughing. The ploughing system is

effected in the following manner: the land having been worked to a tilth is ploughed again in the ordinary way, but the potato sets are laid in the horse-walk near to inside edge of every second or third furrow. When the ordinary plough is employed it is usual to plant the potatoes in every third furrow, each furrow being eight or nine inches in width. The fresh furrows ploughed cover in the sets, and the operation is concluded. The after-working of the land is carried out at convenient seasons. The potatoes are placed from 12 to 20 inches apart where the rows are from 20 to 30 inches wide, according to the variety of potato planted. Five men can drop the potatoes as fast as the ploughs work round (it being presumed that there are as many ploughs at work as there are furrows turned on each row of potatoes); but it usually takes seven women or children to keep the ploughs going. The other method of planting on the flat—spading-in—is done as follows: the land is worked to a fine tilth, and straight rows are drilled across the field at the required width apart as guides to the planters. The planters work in the



manner indicated. A makes holes at given distances along the coulter mark, and his assistant drops a potato into it. B makes corresponding holes behind A, and throws the dirt he lifts out on to the potato in A's row; and C follows B in the same way, by which means the whole

field is planted. This is such an expeditious way of working that a man and child of fourteen can plant an acre in a day.

Fine weather should be selected for this work, as treading when the land is wet has an injurious effect on it. A somewhat similar, but not so expeditious, method of planting is effected by making holes with a stout dibble, which in this case takes the form of a long stake, provided a few inches from the bottom with a foot rest to make the insertion more easy. Into the hole thus made a set is dropped, and the earth is covered over it by harrows, but there is no special advantage over spading, and the cost is considerably greater.

The sets should be about the size of a duck's egg, and from 12 to 15 cwt. are required to plant an acre.

CHAPTER XI.

HOEING ; HARVESTING ROOT CROPS, ETC.

HOEING is a most valuable portion of the labourer's work, but owing to the inferior hoes that are used the work done is not so satisfactory in many cases as it should be. The hoe blade should be constructed of well-tempered steel, which will keep a sharp edge without being brittle enough to fly when it is struck against a hard stone. The neck of the hoe by which the blade is connected with the handle should be long and well-

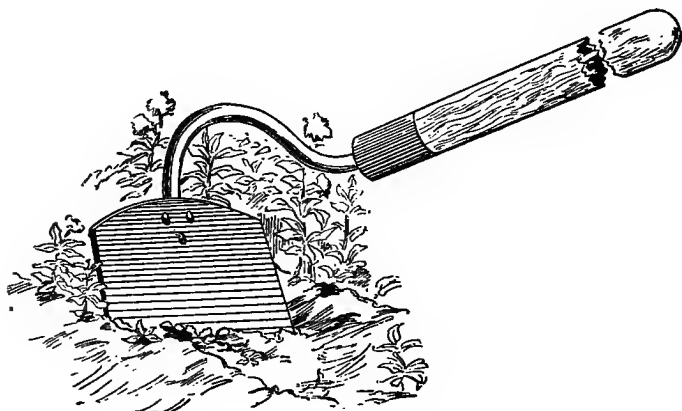


Fig. 52.—Swan-neck Hoe.

curved, the swan or crane neck hoe being the most suitable shape, as it allows the loosened mould to fall back

freely over the top of the blade, and, therefore, causes no blocking, as so frequently happens when the blade is attached by other common methods, such as the double-

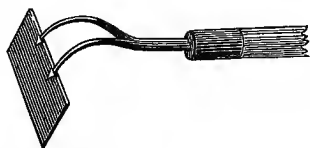


Fig. 53.—Double-neck Hoe.

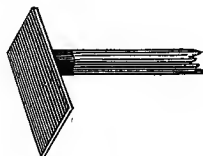


Fig. 54.—Ring-neck Hoe.

neck, or ring-neck, which, though secure means of holding the blade in position, prevent the hoe from being drawn freely through the ground, and necessitate short chops instead of long strokes being taken. The hoe should be thrust forward as far as the workman can reach, and bring his strength to bear upon it sufficiently to ensure the blade being drawn deeply enough into the ground. Each stroke should be made to join the preceding one, or part of the ground will remain unmoved. Hoeing is done for two purposes: to destroy weeds, and to loosen the surface so as to afford better tillage. If the land becomes set down, and on the surface, the moisture evaporates and the crop suffers; whereas, the loosening of the soil by hoeing causes the moisture to remain in the soil, therefore hoeing is beneficial in dry seasons.

On stony land it is not possible to hoe so easily as where the soil is free from stones, as the stones throw the hoe aside, and therefore shorter strokes are advisable; but on land free from stones a stroke of 4 ft. to 5 ft. may be taken. "Snatch"-hoeing is very successfully done on light free soils where there are no stones.

By means of the snatch-hoe three rows of corn may

be hoed simultaneously. The hoe is provided with a mortised head, which allows the blades to be fitted in at any convenient distance from each other, so as to be

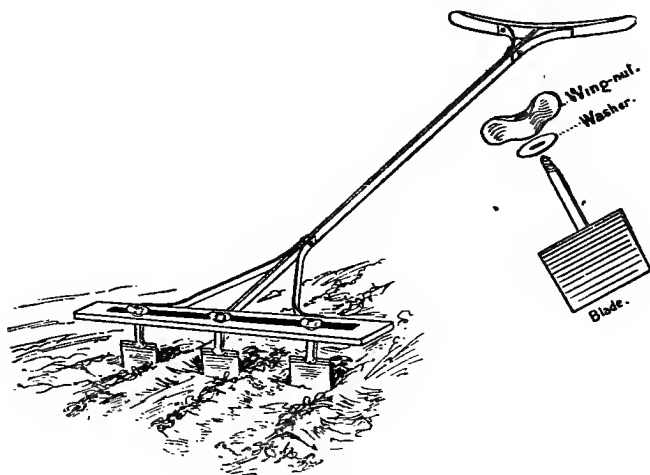


Fig. 5.—Snatch-Hoe.

adjustable to rows drilled at a given width apart. The workman holds a long handle and walks backward, pulling the blades through the ground by short snatches, and can hoe from 3 to 4 acres per day.

Wheat hoeing is best performed by hoes from $4\frac{1}{2}$ in. to 6 in. in width, according to the distance apart the rows are drilled.

Barley is usually drilled rather closer than wheat, and a somewhat smaller hoe is necessary.

Beans, which are usually drilled at a width from 16 in. to 2 ft. apart, may be hoed with a broader hoe from 6 in. to 7 in. in width; but as the horse-hoe is generally used

freely to clear the space between the rows it is not necessary to hoe wider than the horse-hoes will conveniently cut.

Peas, which are drilled from 9 in. to 14 in. apart, may be hoed with a hoe from 6 in. to 9 in. in width.

Roots are hoed with a 9-in. hoe. As the horse-hoe is able to clear the greater part of the row the attention of the hoer need only be given to the portion immediately against the plants. This is called flat hoeing, and on weedy land should be performed before the plants are set out. The setting out, or singling, should take place when the plants have attained their rough leaf, and are at least three or four inches across. The endeavour when setting them out is to leave the plants singly at a distance of from 10 in. to 16 in. according to the width of the drill rows, and also to the fertility of the field. The hoe should be made to cut to a considerable depth, especially if the land is not in a clean condition, because this cross-hoe affords the best opportunity to clear the plant rows of weeds. It is usual to go over the task again in the course of a few weeks, when any double plants are cut out, and weeds are destroyed. In Ireland, roots are practically never singled by the hoe, but by the more laborious system of hand picking, which in addition to being more expensive, has very little effect in destroying weeds, such as couch, consequently one of the best results obtained when singling is lost. It is very important that the hoe should be more freely used in Irish root crops. Potato hoeing should commence as soon as the potatoes show sufficiently above ground to afford a guide to the workman, and should be repeated as often as convenient, for successful potato culture depends very much on the frequent and deep stirring of the land.

When onions are drilled, narrow hoes may be used to hoe the spaces between the rows, but the special hoeing which the crop requires is effected by means of a small hoe, the blade of which is not more than two inches wide. The hoer kneels down to work, going practically on all fours, and is expected to cut out every weed in the field. When the crop is sown broadcast the whole of the work is done by the small hoe.

The increase in the extent of land let as allotments has called for more expeditious tools to aid in the cultivation. The Bartram push hoe is particularly serviceable for hoeing between wide rows of potatoes, cabbages, and

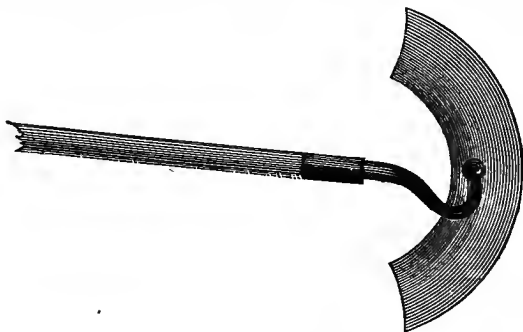


Fig. 56.—Bartram Push-Hoe.

turnips. The principle of the horse-hoe is adopted. The hoe is capable of being made wide enough to cover the width of the uncropped land between the drill rows, and yet be workable by a man. On loose or newly-worked land a man can clean three acres in a day. The blade is made with a slight bevel which tends to cause it to draw into the ground and to run level, while at the same time the friction is reduced to a minimum, as only the cutting edge

is in contact with the ground. The workman simply pushes the hoe in front of him, but he occasionally pulls it towards himself to relieve it of weeds; the weight of his body largely helps him in pushing, and the strain on the arms is very slight.

Spuds are used for cutting thistles and other stout weeds possessing an upright habit of growth, when growing in corn or pastures where the hoe cannot conveniently be used. They should be attached to fairly strong handles about 5 ft. or 6 ft. in length. If clover seeds are sown in a corn crop they should not be used, as they cut up the young clover.



Fig. 57.—The Thistle Spud.

The weed hook, or, as it is often called because it is employed for pulling down brambles, the bramble hook, is convenient for cutting thistles in tall corn. It should be used



Fig. 58.—The Weed Hook.

in preference to the spud when the corn crop has a young clover crop growing up in it.

HARVESTING ROOT CROPS.

Root crops are got up in various ways. Mangels should be pulled by hand, and, when the tops are cut off, be placed in clamps or root-houses for feeding at some future time. The most expeditious way of getting up mangels is to pull them and lay them in rows wide enough apart to allow carts to pass between them to pick them up. The bulbs should be laid in rows as neatly as possible, and the tops should be cut off with a short fagging hook; care must be taken not to cut the bulb, or some of its sap may be lost, and decay may be set up.

The rootlets should not be cut off, as the roots keep better when these are left on. If care is taken to collect the leaves when pulling the bulbs, they may be cut off very neatly, and without injury to the roots. Many mangel growers have the leaves screwed off by hand, as they think much damage is done by accidental cutting when the leaves are cut off; but a personal experience leads to the conviction that this is an unnecessary precaution unless the operator is very careless in the use of the knife. A small quantity of leaf stem may be left on without causing injury, and if the crown of the root is not cut into, no damage can be done.

When filling carts the roots should be thrown in by hand, and not be stuck by a fork. To clamp the roots a shallow trench about six feet in width should be ploughed out, and the soil be thrown back to be used for earthing up the heap subsequently. The roots should be stacked in such a way that a section across it shows an isosceles triangle. The roots should be laid as upright as they will conveniently lie. Over this a layer of straw some 6 in. thick should be laid, and on this a layer of dirt from 4 to 6 in. should be placed. If the locality is a very cold and exposed one a further roofing of straw thatch, or long dung, or ditch trimmings is put on.

Where turnips and swedes can be pulled by hand it is better to get them out of the ground in this way than to have to resort to a turnip-pecker to raise them. If the roots are to be stacked on the field in heaps a chain apart, it is usual for the workman to begin to pull the roots on the site of the heap. He pulls up the root with his left hand, and with a short-bladed fagging hook or sickle held in his right hand trims off the thickest of the

dirt from the roots; and then swinging the root by the leaves knocks it sharply against the edge of the hook, and



Fig. 59.—A Turnip Pecker.

the bulb is jerked or thrown on to the heap. In this way the biggest roots may be easily thrown as far as is required.

If the roots are being clamped with the view of being fed some considerable time hence, the rootlets should not be cut off. On strong soils it is necessary to use a turnip pecker to pull up the roots, and the tops must be cut off as before stated, but if they are to be carted away from the land at once, the tops may be cut off before they are pecked up, and, after pecking, nothing need be done beyond throwing them into the cart.

Kohl-rabi should be chopped off. The peculiar bulb which forms on the stem above ground is the portion of the plant to be saved; the stem is very woody and hard, so the place to strike it is immediately below the bulb, where there is a softer section.

The rabi chopper is an adze, the blade being made to curve under, so that it may be more easily brought to strike the proper spots.



Fig. 60.—A Rabi Chopper.

Cabbages are best cut with a strong knife or chopper. A piece of old scythe blade fixed into a stout handle is well suited to the

purpose. The heart of the cabbage should be pressed on one side so that the stem may be more easily got at.

Carrots and parsnips must be dug by a fork. The tines should be driven vertically into the soil and the roots be lifted out. If the soil is very loose, and the tops are still on, it is often convenient to raise them slightly by the fork and then gather them; but if the soil is stiff, they must be thrown out of the ground.

Silage is now made on a fairly large scale in some districts, and may be considered a part of ordinary farm practice. When silage is made in pits or silos the workmen must be careful to pack the material close to the sides of the building so that air cannot get to it, or mould will be formed. All green material shrinks towards the middle of the silo, though long grass does this to a greater extent than that which is chaffed, therefore, an extra quantity must be laid around the sides and be well trodden and packed in. The rest of the surface should be kept level, as pressure is more evenly applied then than when it lies in lumps. When the weight is applied, care must be taken that the outside gets its share, for it is at the outside that the chief loss by mould is caused. The inside of the mass is ensilaged by the pressure of that around and above it.

The walls of a silage stack should be kept upright. If there are any bulging portions they should be pulled off so that the proper form of the stack is kept. The loosest pieces around the sides should be pulled out; but it is not advisable to pare them, for the loose pieces seem to afford protection and prevent, to some extent, the formation of mould.

When building a clump or heap, which is now a common practice, the material is put together very much in the same way that drawn-up dunghills (Fig. 41) are made. The chief points to observe are that the outsides are made higher than the rest of the heap, and that the horses and carts are led along the outsides as much as possible. The sides should be kept vertical, the surface should be kept level, and be well trodden, so that the horses may travel more easily over them, and also that the mass may settle evenly, and without large air spaces being formed.

CHAPTER XII.

HEDGING AND DITCHING.

HEDGING and ditching is skilled work, and one of the acts of husbandry for which prizes are most frequently offered. Hedging is of two kinds—live hedging and dead hedging. Live hedging consists of planting, trimming and layering. Hedges are planted on beds or slightly raised flat banks near the ground, or on narrow raised banks. Flat banks about 4 ft. in breadth are most commonly adopted in England. If it is intended that a hedge should be straight, it is very essential that accurate straightness should be obtained, and the bed should be carefully lined out. If the land is very poor, or a new hedge is to replace an old one which had stood on the same ground, it is advisable to trench in some farmyard manure; it is always well to trench the ground—that is, to dig to a depth of about 2 ft. If it is desired to form a ditch as a water-course on the side, the earth thrown out of the cutting should be laid on the bank. If no ditch is required, narrow gutters on each side, about 2 ft. wide and a foot or more deep, should be cut, and the earth thrown on to the beds. If the hedge is on the side of a field that is likely to be stocked with cattle or sheep, a protective fence will be required on one or both sides, as shown in Fig. 61; but if there is no stock, the fence may be dispensed with. The height and strength of the fences should be regulated according to the kind of stock, and the width and depth of the ditches.

When a live hedge is planted on a highly raised bank, the bank is made at an angle at which it can stand safely, the width of the base being in accordance with the

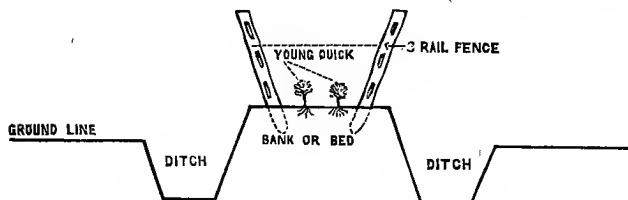


Fig. 61.—Section of New Quick-Set Fence.

height. When the bed is well prepared and consolidated, the plants should be let in by means of a spade; a cord should be used as a guide, and the earth should be opened by inserting the spade and levering open a small trench, into which the plant should at once be placed, and then trodden firmly in, so that the roots may obtain a hold as quickly as possible. The plants should be placed in two parallel rows about 8 in. to a foot apart; the plants should be set 8 in. from each other. In this way a double hedge is obtained, which is useful, as in after years it will be advisable to cut down one side, to give it new vigour, and the other will still be an efficient fence meanwhile; whereas, when only one row is planted, the whole hedge has to be cut down, and until new growth takes place there is no fence.

The hedge should be kept scrupulously clear of weeds for some years; and at the end of the third year (though this is somewhat regulated by the growth made) the hedge should be cut down to within a few inches of the ground: this will give it a more sturdy growth, and tend to make it throw out shoots near the ground. A good maxim in

connection with live hedge-making is to keep the bottom thick, as the top will then be strong enough. If good growth is obtained at the bottom of the hedge it may be allowed to grow up so as to form a fence; but if the growth is weak it should be kept back so as to induce

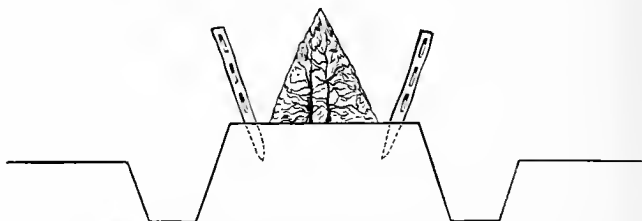


Fig. 62.—Section of Quick-set Hedge, showing triangular shape.

bottom growth. The hedge should be trimmed so as to form what is known as a "hog-mane," from the supposed resemblance to the mane of a hog-maned horse or pony.

When the fence has attained sufficient height and



Fig. 63.—Hedging Bills.

strength the wooden fence may be taken up, and for some years brushing or trimming with a long bill-hook will be

sufficient to make it retain its shape. Trimming should always be done with an upward stroke of the bill. Hedging-bills are made in various shapes to suit the prevailing fancy of the districts in which they are to be used. As a rule, it may be taken that a somewhat curved bill is best for light splashing, but that a stouter and straighter bill is preferable where there is much stout wood to cut.

In course of years, particularly if the hedge has not been kept clear of weeds and briars, it may be found necessary to take more thorough steps to strengthen the wood at the bottom. Where hedges are planted in double rows, one row may be cut down to within a few inches of the ground, and, during the time this is making growth, the other row will form a satisfactory fence. Some very careful hedgers cut down one side every five or six years with very good results.

If the hedge is very bad, being much overgrown at top, and gappy at the base, it is advisable to lay it, or plash it, as it is termed in some districts. Discretion must be used as to the manner in which the work should be done. All briars, blackberry bushes, and elder bushes should be taken out by the roots, and if there are any other plants of inferior growth, such as maple, hazel, &c., they, too, are best destroyed if there is sufficient white-thorn or black-thorn to fill in the gaps. If there is a ditch, the banks should be pared, and the loose dirt from the bottom should be laid up to the roots of the hedge. The hedge should be roughly prepared for laying, and coarse wood should be chopped out, the stumps of large growths being cut level with the ground, so that they may throw up young shoots, and not remain as eyesores. When land enclosed by the

hedges is stocked yearly with cattle, it is necessary to have the hedges strong enough to resist cattle; for this reason the wood is generally allowed to grow several feet higher than the fence will be made, and during the last year or two it is not trimmed; the wood, thus grown, is long enough to make a strong wattle, and the stakes will be stout. If immediate strength is desired, the effect will be best realised by leaving a stout stem every eighteen or twenty inches, merely cutting off the top branches to the required height; the stake thus left will be strong, and will not decay. There is but one objection to live stakes, and that is so much sap flows up them they produce an immense number of small shoots which, in course of time, give a bad appearance to the hedge; this is the sole objection, and, if the hedges are kept well trimmed, it is not of serious importance. Where, however, the fence is required as an ornament, the stubby appearance should be avoided, and temporary stakes may be inserted, though the strength of the hedge is not so well ensured.

The following explanations and illustrations show in a diagrammatic manner the form of a newly-wattled quick, also the most suitable method of filling in parts where wide gaps have formed. As the individual plants which go to make a hedge are in reality small trees, there is a tendency for the upper part of the hedge to be developed at the expense of the lower. It should always be borne in mind that the strength of a hedge is proportionate to the density of the growth at the bottom. A section of a well-grown hedge should form a triangle, the bottom of the hedge being the base of the triangle. Unfortunately, the base is often at the top and the apex at the bottom; when this occurs it is merely a matter of

time for the hedge to become weakened, as the overshadowing by the top prevents young shoots being thrown out at the bottom. Gaps soon appear, and the hedge is a fence no longer. It is very important that the training of the hedge be attended to each season, it then costs very little. When, however, a hedge has been allowed to become ill-shaped and gappy considerable expense is necessary to make it an effectual fence; and this expense becomes greater the longer it is left undone. If a hedge is only a little weak a few growing rods may be drawn down and laid in along the bottom, the whole hedge then being cut into the required shape.

When hedges become very gappy, or fresh vigour is found to be necessary, the most usual and the best means of making them into efficient fences is to "lay" or "layer" them. When laying a hedge, a considerable portion of the wood is cut out, only sufficient being left to supply stakes and wattle for the new fence. This is an important matter, as in laying a hedge it must be remembered that the object is not to make a full hedge

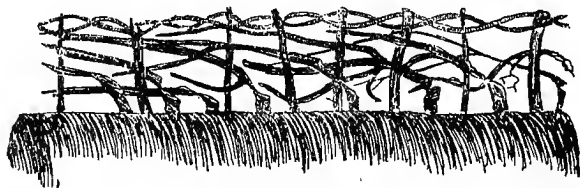


Fig. 64.—Newly laid hedge.

at once, but to make it sufficiently strong to answer as a moderate fence in the first year, after which the young shoots will have grown up and filled in the bottom. If

too much is worked in, it becomes smothered by the young shoots, and, in the course of a year or two, rots, making the middle of the hedge rotten, so that the work has soon to be done over again. "Freshly laid hedges should *grow* into fences," is a maxim every hedger should remember.

Laying is effected by cutting a number of stakes at the height required for the new hedge, arranging, where possible, that the stakes are from 20 in. to 30 in. apart. Around these the growing wood is wattled—that is, is wound in and out, as is shown in Fig. 64. When sufficient wattle is worked about the stakes, the header, or edder, should be put on. This consists of a few long rods or briars twisted round the top of the stakes, and then round themselves in between the stakes, the object being to keep the wattle from springing up.

There is a natural tendency for the wood to spring back to its original position; consequently, it is necessary

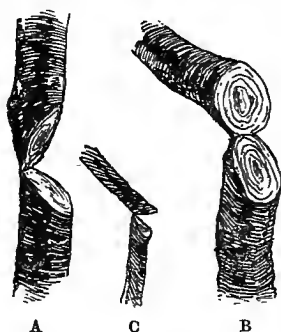


Fig. 65.—Proper methods of cutting growing rods for laying.

to cut it, to take out its elasticity. It is most important, when cutting, to do it with the upward stroke of the hedging-bill or slasher. If wood is cut with a downward stroke it splinters, and wet soon soaks into it, causing decay. If, however, it is made with an upward stroke, the surface is smooth, and no injury occurs. It is

necessary to make the cut nearly the whole way through the rod; otherwise splintering takes place. Very little

more than the bark is required (see Fig. 65, C). If, however, the wood is very thick, a piece should be cut clean out, as at A, Fig. 65, when it can be turned down, as at B, Fig. 65; but the bottom stroke must be upwards, and be made first. In Fig. 66 is a diagrammatic sketch of a gap in a hedge. The stakes (A) are driven into the ground for the wattle to be worked round, as in the gap there are no growing rods. (B) are growing rods, the head or brush having been cut off. In Fig. 67 the gap will be seen to be filled in with wattle, the branches having been worked across it from side to

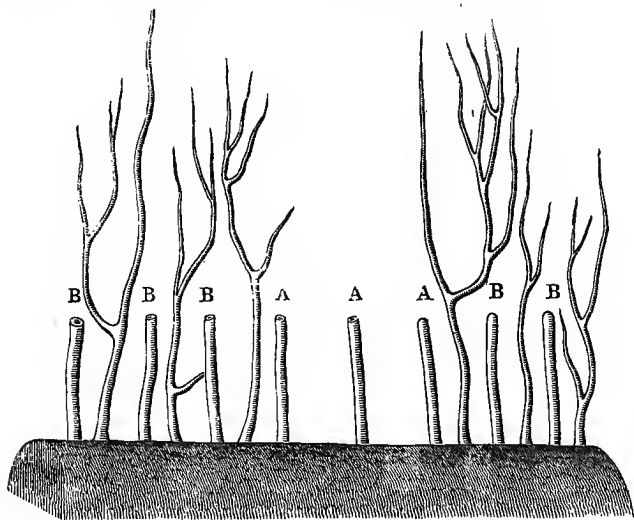


Fig. 66.—A gap in a hedge. The hedge prepared in readiness to fill in the gap.

side, the whole appearing similar to the newly laid hedge shown in Fig. 64, except that in Fig. 64 the wattle is all in one direction. In course of time the

wattle becomes so strongly intertwined that, when the dead-wood stakes rot, the fence is still strong and secure.

The thinning out of the wood causes a free growth of young shoots from the bottom, and these should be allowed to spread out, but the sides should be cut in, so that the hog-mane shape is obtained.

Hedges should be laid in autumn, and early winter, but the trimming may be done at any time; an old adage has it, "trim a hedge whenever the knife is sharp," implying that it is never the wrong season for it. It is, of course, necessary to keep down all growth of weeds at the bottom, otherwise the young shoots are smothered and do not thrive.

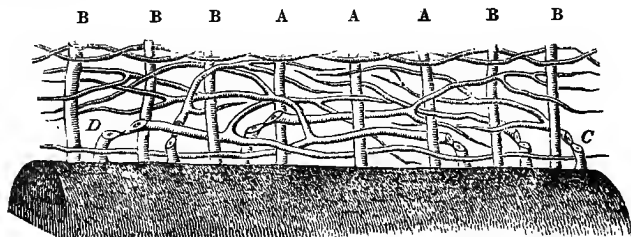


Fig. 67.—The gap filled in, and hedge complete.

Of necessity, the greater part of the work is done in winter, but it is undoubtedly to the advantage of the hedge if the outsides are brushed or trimmed during summer, as the growth on the outside is made more dense; also, because harbourage for insect and fungal pests is done away with. If limited labour does not permit the trimming of the hedges during summer, an effort ought to be made to clear away, by hoeing or chopping, any weed-growth at the bottom. A short faggot-hook is most useful for the purpose of chopping out rubbish.

We have referred chiefly to what are known as white-thorn or quick-set hedges, but there are several other plants which may be used with advantage; although there is nothing else so well suited for all situations and circumstances. Blackthorn, where it will grow, is exceedingly good. Myrobella is fast coming into favour and is remarkable for rapidity of growth. Hazel, maple, and many other thornless woods are met with in different districts which are chiefly noted for bad fences. Holly makes a good fence, but on many soils it does not grow well; and on almost all soils it is of slow growth.

Ditches.—One of the most frequent errors in the construction of ditches is that of making the banks too upright. This should be guarded against, remembering that the nature of the soil differs considerably, and that the natural angle of repose with the horizontal line of compact earth is 50° , while wet sand is only 22° , drained clay 45° , wet clay 16° , gravel 40° , vegetable earth (mould) 28° . If the banks are too stunt, they become a constant source of trouble, as they are frequently breaking, especially until the roots of grasses have bound them more securely. Earth thrown out of ditches, if left on the upper edge of the ditch, is liable to make the banks give way, and should be placed sufficiently far back to avoid this. Old banks frequently break down because the land is ploughed too closely to the edge; the water accumulates in the furrow, and soaks downwards, causing cracks, which ultimately ruin the bank.

Dead Hedges.—Dead hedges are chiefly made by wattling long wooden rods around stakes driven into the

ground at distances of about 18 inches apart. The best wood for this purpose is hazel, though an admixture of young oak or ash is preferred by some as they make very enduring stakes. Any straight undergrowth may be worked up, and even willow and other less favourable young wood is "called into requisition where there is nothing better at hand. A bullock fence is generally made about 4 ft. 8 in. high above the level of the ground; and a sheep fence about 2 ft. 6 in., the stakes being left a few inches higher. As stouter wood is desirable for the higher fence, it is desirable to select it with that view.

The main features of strength in a dead hedge are the

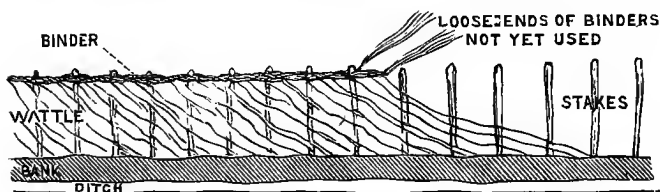


Fig. 68.—A dead hedge in course of construction.

stakes and the header or binder. If the hedge is to replace one which has become worn out, the old one should be pulled up and tied into faggots or bundles. Thin wands should be taken from the new wood and twisted into withes or bands; the upper end of the wand should be formed into a loop, and to make the wood tough it is sometimes necessary to subject the part where the loop is to be made to the influence of heat, very little heat being required, that from embers of a small wood fire being sufficient; pliability should be obtained by treading on the rod near where the loop is to be formed, and working it with the hands until the object is attained;

the loose twigs should then be twisted so as to form a loop, and the withe is complete. Having cleared away any rubbish that may have accumulated, a bank should be formed, the material being taken from a gutter which should be dug about 18 inches from the line where the stakes are to be placed; this gutter will be a protection to the hedge, for, if dug sufficiently broad, cattle will be unable to place their full weight on the hedge, and it will be more stable. If dug about a foot deep and $1\frac{1}{2}$ ft. broad a fairly good bank will be obtained.

The stoutest wood should be cut out for making stakes the stakes for a bullock fence should be sufficiently long to be driven into the ground from 1 ft. to 2 ft. according to the stolidity, and should stand nearly 5 ft. above ground; a short-handled bill is best for cropping and sharpening stakes. A handy man lays the rod across one knee and quickly cuts off the stake to a convenient length. They are best sharpened on a chopping block. The stakes should be driven into the ground by means of a mall, the most convenient shape being that shown in Fig. 69 as the stakes are generally too high for a man to reach with an ordinary hammer-shaped mallet. It is in one piece, and is made out of the root of an ash plant, and is so used that the blow is struck at the angle formed by the stem, as shown in diagram 69 by a star.



Fig. 69—A Hedging Mall.

The rods of hazel should be wattled round the stakes, care being taken to use the heavier wood for the lower portion of the hedge, otherwise it looks top-heavy, and in reality is not so well constructed. All the brush or loose

branches at the top of the rods should be worked to the opposite side of the stakes to that on which the hedger stands where they form a dense mass which helps to strengthen the hedge. The side on which the hedger stands should be worked evenly and compactly. The hedger shoves the end of each rod well into the ground, or into the already formed wattle, thus bracing the work, and then twists it round each stake, obtaining sufficient compactness by striking it with the mall, bill, or even an iron bar if it requires it.

The headers should be worked up closely. The thick ends of the headers being placed in an opposite direction to those of the wattle. Eight rods, each about an inch in diameter, should be used ; four of which should be worked round one side of the stake, and four round the other ; they should then be turned round each other once or twice between each pair of stakes, and then knocked down firmly on to the wattle. After this the stakes should be chopped off to one level, at about 5 or 6 in. above the header. This is done as follows :—The hedger takes the mall in his left hand, and steadying it by placing it under the arm and against the body, places it against the stake to steady it, and then chops with the stout bill held in the right hand.

Temporary dead hedges are sometimes made by digging out a trench, and placing in bushes against the side so that they stand up so as to resemble an ordinary quick-set edge ; by packing the earth back on them they are retained firmly, and will answer as a sheep fence.

CHAPTER XIII.

MISCELLANEOUS OPERATIONS.

Preparation of Plaiting Straws.—Plaiting straws are prepared on the farm in some districts. When wheat-straw is intended for plaiting purposes, it should be handled carefully. The sheaves should be neatly tied, and very carefully stacked in the barn or rick. It is necessary that the sheaves should be in the barn at the time of drawing, as the process is a lengthened one, and the risk from wet is too serious to be permitted.

The “drawer” is provided with a stout leather belt, and in this he places several sheaves until he forms a bundle as big as he can conveniently stand astride. When he has tightened the belt, as much as he is reasonably able, he stands across the bundle with his face towards the ears, and near to them; he then seizes a bunch of ears between his two hands, then thrusting his hands from his body, he draws out the straws, all the ears being close together. He continues pulling until he can hold no more, and ties the handful with two or three straws in the bundle. He throws this aside, and continues the process, occasionally tightening his bundle until there is nothing left in the strap but loose, broken straws, useless for plaiting purposes. He then proceeds to comb off the “flag” which was not stripped off in the action of drawing. A small rake, about 16 in. long, and similar in shape to the head of a rake with a few teeth missing at one end to

form a handle, is used for combing; the teeth being of iron and rather closer than in the ordinary field rake. With this the flag is stripped easily, the combing being continued from the ears downwards until the straw is perfectly clean. Subsequently the ears are cut off. A piece of scythe-blade is fixed in the wall horizontally, with edge uppermost, and the drawer, taking the bundles in both hands, quickly cuts off the ears and leaves nothing but clean straw. This is bound into cylindrical trusses, the shape being kept by laying the butts of the straws outwards at both ends of the truss. Two stout bands secure the truss, and it is ready for the bleacher; but the subsequent treatment is not carried out on the farm.

Distribution of Artificial Manures.—It is essential that artificial manures are well broken, otherwise they cannot be distributed so evenly as is necessary. Plants cannot search very far for their food; and it must be borne in mind that when 100 lbs. of any manure are applied to an acre, that each pound has to manure forty-eight square yards, and that an ounce has to be spread over three square yards. If this is recognised, it will be easily understood how necessary it is that lumps, weighing an ounce, or even half an ounce, should not be distributed. All concentrated manures should be broken by a heavy beater, and sifted through a sieve with not more than a half-inch mesh.

When sowing these manures broadcast, the sacks should be made to contain equal quantities, and should be placed so that each sack has to be put on a given extent of land. If they are laid indiscriminately about, it is probable that the quantities will be applied irregularly.

Farm yard manure should be spread with equal carefulness, for the best results to be obtained. The chief point to observe is that the places where the heaps are laid are well cleared, so that they do not receive more than their share. It is a very common sight to see the effect of bad work in the succeeding crop, the site of each heap being plainly marked; which is evidence that part of the field received more than its share, while the other part suffered for want of it. If the dung is too short for all of it to be thrown out by a fork, a shovel should be used to scrape out the remaining pieces. Large lumps should be broken, and the coating of dung should show a common appearance throughout the field.

OTHER MISCELLANEOUS OPERATIONS.

Cart-wheels should be kept well greased, as friction on the axle wears the metal, and causes much harder work on the part of the horses. Frequent applications are far preferable to lavish dressing on rare occasions.

Cart ropes should be kept in dry places when not in use, as they rapidly decay when wet.

Rick-cloths, tarpaulins, and other sheets, should be dried before being folded and stored. If the weather is too wet to permit drying out of doors, they should be suspended on beams or ropes under cover.

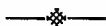
Machinery should be cleaned and stored when not required for use for some time. Wood-work suffers very much from exposure to sunshine, and both metal and wood are badly influenced by wet. The greatest damage is done when dust or dirt is allowed to accumulate on wood-work, and the dust becomes converted into mud; for

growth almost always takes place, and the roots penetrate the wood-work, causing very rapid decay.

Vermin such as rats should be kept down. Under ordinary circumstances the ordinary spring-trap answers the purpose sufficiently well. The best place to trap rats is in water; for if the trap is placed in the runs in shallow water there is no smell to warn the animals of the presence of a trap, and the animal, when caught, is soon drowned. Where sparrows are too numerous, they may be caught very easily in the Canadian sparrow-traps which are now sold. If a little grain is placed in them no other attention is required. Poisoning is a rapid but not a wise method of destroying them, as poultry or dogs may be the undesired victims. If grain is steeped in poison, and not used at once it should be destroyed, or it may be given by mistake to cattle or horses. In one instance fourteen horses were poisoned through this inadvertence.

Mice should be kept out of stacks by mouse poisons, which may be purchased. The pellets should be placed well into the stack, but near the outsides, especially on the sunny side. Cats, owls, and hawks are the natural enemies of this class of vermin and should be encouraged as much as possible.

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